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INVESTIGATIONS

THE AMERICAN NAUTICAL ALMANAC

FOR THE YEAR

1951

UNITED STATES NAVAL OBSERVATORY
WASHINGTON
D.C.

STARS

No.	Name	Mag.
1	Alpheratz	2.2
2	Caph	2.4
3	Deneb Kaitos	2.2
4	Ruchbah	2.8
5	Achernar	0.6
6	Polaris	2.1
7	Hamal	2.2
8	Acamar	3.4
9	Marfak	1.9
10	Aldebaran	1.1
11	Rigel	0.3
12	Capella	0.2
13	Bellatrix	1.7
14	El Nath	1.8
15	Alnilam	1.8
16	Betelgeux	0.1–1.2
17	Canopus	−0.9
18	Sirius	−1.6
19	Adhara	1.6
20	Procyon	0.5
21	Pollux	1.2
22	Epsilon Argus	1.7
23	Al Suhail	2.2
24	Miaplacidus	1.8
25	Alphard	2.2
26	Regulus	1.3
27	Dubhe	2.0
28	Denebola	2.2
29	Acrux	1.1
30	Gamma Crucis	1.6
31	Beta Crucis	1.5
32	Alioth	1.7
33	Mizar	2.4
34	Spica	1.2
35	Alkaid	1.9
36	Theta Centauri	2.3
37	Arcturus	0.2
38	Rigil Kentaurus	0.3
39	Kochab	2.2
40	Alphecca	2.3
41	Dschubba	2.5
42	Antares	1.2
43	Alpha Tri. Aust.	1.9
44	Sabik	2.6
45	Shaula	1.7
46	Rasalague	2.1
47	Etamin	2.4
48	Kaus Australis	2.0
49	Vega	0.1
50	Nunki	2.1
51	Altair	0.9
52	Peacock	2.1
53	Deneb	1.3
54	Enif	2.5
55	Al Na'ir	2.2
56	Fomalhaut	1.3
57	Markab	2.6

CORRECTIONS TO OBSERVED ALTITUDES

STARS AND PLANETS				SUN'S LOWER LIMB				HEIGHT OF EYE			
Obs. Alt.	corr'n	Obs. Alt.	corr'n	Obs. Alt.	corr'n	Obs. Alt.	corr'n	Feet	corr'n	Feet	corr'n
° ′	′	° ′	′	° ′	′	° ′	′		′		′
4 23	−10.9	9 44	− 5.4	4 22	+ 4.9	9 39	+10.4	1.0	− 1.0	46	− 6.5
4 26	−10.8	9 56	− 5.3	4 25	+ 5.0	9 51	+10.5	1.2	− 1.1	47	− 6.6
4 29	−10.7	10 08	− 5.2	4 28	+ 5.1	10 03	+10.6	1.4	− 1.2	49	− 6.7
4 32	−10.6	10 20	− 5.1	4 31	+ 5.2	10 15	+10.7	1.7	− 1.3	50	− 6.8
4 36	−10.5	10 33	− 5.0	4 34	+ 5.3	10 27	+10.8	2.0	− 1.4	52	− 6.9
4 39	−10.4	10 46	− 4.9	4 37	+ 5.4	10 40	+10.9	2.3	− 1.5	53	− 7.0
4 42	−10.3	11 00	− 4.8	4 41	+ 5.5	10 54	+11.0	2.6	− 1.6	55	− 7.1
4 46	−10.2	11 14	− 4.7	4 44	+ 5.6	11 08	+11.1	3.0	− 1.7	56	− 7.2
4 49	−10.1	11 29	− 4.6	4 48	+ 5.7	11 23	+11.2	3.4	− 1.8	58	− 7.3
4 53	−10.0	11 45	− 4.5	4 51	+ 5.8	11 38	+11.3	3.8	− 1.9	60	− 7.4
4 56	− 9.9	12 01	− 4.4	4 55	+ 5.9	11 54	+11.4	4.2	− 2.0	61	− 7.5
5 00	− 9.8	12 18	− 4.3	4 58	+ 6.0	12 10	+11.5	4.6	− 2.1	63	− 7.6
5 04	− 9.7	12 35	− 4.2	5 02	+ 6.1	12 28	+11.6	5.1	− 2.2	65	− 7.7
5 08	− 9.6	12 54	− 4.1	5 06	+ 6.2	12 46	+11.7	5.5	− 2.3	66	− 7.8
5 12	− 9.5	13 13	− 4.0	5 10	+ 6.3	13 05	+11.8	6.1	− 2.4	68	− 7.9
5 16	− 9.4	13 33	− 3.9	5 14	+ 6.4	13 24	+11.9	6.6	− 2.5	70	− 8.0
5 20	− 9.3	13 54	− 3.8	5 18	+ 6.5	13 45	+12.0	7.2	− 2.6	72	− 8.1
5 24	− 9.2	14 16	− 3.7	5 22	+ 6.6	14 07	+12.1	7.8	− 2.7	74	− 8.2
5 28	− 9.1	14 40	− 3.6	5 26	+ 6.7	14 30	+12.2	8.4	− 2.8	75	− 8.3
5 32	− 9.0	15 04	− 3.5	5 31	+ 6.8	14 54	+12.3	9.0	− 2.9	77	− 8.4
5 37	− 8.9	15 30	− 3.4	5 35	+ 6.9	15 19	+12.4	9.6	− 3.0	79	− 8.5
5 41	− 8.8	15 57	− 3.3	5 39	+ 7.0	15 46	+12.5	10.3	− 3.1	81	− 8.6
5 46	− 8.7	16 26	− 3.2	5 44	+ 7.1	16 14	+12.6	11.0	− 3.2	83	− 8.7
5 51	− 8.6	16 56	− 3.1	5 49	+ 7.2	16 44	+12.7	11.7	− 3.3	85	− 8.8
5 55	− 8.5	17 28	− 3.0	5 53	+ 7.3	17 15	+12.8	12.4	− 3.4	87	− 8.9
6 00	− 8.4	18 02	− 2.9	5 58	+ 7.4	17 48	+12.9	13.2	− 3.5	89	− 9.0
6 05	− 8.3	18 38	− 2.8	6 03	+ 7.5	18 24	+13.0	14.0	− 3.6	91	− 9.1
6 11	− 8.2	19 17	− 2.7	6 08	+ 7.6	19 01	+13.1	14.8	− 3.7	93	− 9.2
6 16	− 8.1	19 58	− 2.6	6 13	+ 7.7	19 42	+13.2	15.6	− 3.8	95	− 9.3
6 21	− 8.0	20 42	− 2.5	6 19	+ 7.8	20 25	+13.3	16.4	− 3.9	97	− 9.4
6 27	− 7.9	21 28	− 2.4	6 24	+ 7.9	21 11	+13.4	17.3	− 4.0	99	− 9.5
6 32	− 7.8	22 19	− 2.3	6 30	+ 8.0	22 00	+13.5	18.2	− 4.1	101	− 9.6
6 38	− 7.7	23 13	− 2.2	6 35	+ 8.1	22 54	+13.6	19.1	− 4.2	103	− 9.7
6 44	− 7.6	24 11	− 2.1	6 41	+ 8.2	23 51	+13.7	20.0	− 4.3	105	− 9.8
6 50	− 7.5	25 14	− 2.0	6 47	+ 8.3	24 53	+13.8	21	− 4.4	107	− 9.9
6 56	− 7.4	26 22	− 1.9	6 53	+ 8.4	26 00	+13.9	22	− 4.5	110	−10.0
7 03	− 7.3	27 36	− 1.8	7 00	+ 8.5	27 13	+14.0	23	− 4.6	112	−10.1
7 09	− 7.2	28 56	− 1.7	7 06	+ 8.6	28 33	+14.1	24	− 4.7	114	−10.2
7 16	− 7.1	30 24	− 1.6	7 13	+ 8.7	30 00	+14.2	25	− 4.8	116	−10.3
7 23	− 7.0	32 00	− 1.5	7 19	+ 8.8	31 35	+14.3	26	− 4.9	119	−10.4
7 30	− 6.9	33 45	− 1.4	7 26	+ 8.9	33 20	+14.4	27	− 5.0	121	−10.5
7 37	− 6.8	35 40	− 1.3	7 34	+ 9.0	35 17	+14.5	28	− 5.1	123	−10.6
7 44	− 6.7	37 48	− 1.2	7 41	+ 9.1	37 26	+14.6	29	− 5.2	126	−10.7
7 52	− 6.6	40 08	− 1.1	7 49	+ 9.2	39 50	+14.7	30	− 5.3	128	−10.8
8 00	− 6.5	42 44	− 1.0	7 56	+ 9.3	42 31	+14.8	31	− 5.4	130	−10.9
8 08	− 6.4	45 36	− 0.9	8 04	+ 9.4	45 31	+14.9	33	− 5.5	133	−11.0
8 16	− 6.3	48 47	− 0.8	8 13	+ 9.5	48 55	+15.0	34	− 5.6	135	−11.1
8 25	− 6.2	52 18	− 0.7	8 21	+ 9.6	52 44	+15.1	35	− 5.7	138	−11.2
8 34	− 6.1	56 11	− 0.6	8 30	+ 9.7	57 02	+15.2	36	− 5.8	140	−11.3
8 43	− 6.0	60 28	− 0.5	8 39	+ 9.8	61 51	+15.3	38	− 5.9	143	−11.4
8 52	− 5.9	65 08	− 0.4	8 48	+ 9.9	67 17	+15.4	39	− 6.0	145	−11.5
9 02	− 5.8	70 11	− 0.3	8 58	+10.0	73 16	+15.5	40	− 6.1	148	−11.6
9 12	− 5.7	75 34	− 0.2	9 08	+10.1	79 43	+15.6	42	− 6.2	150	−11.7
9 23	− 5.6	81 13	− 0.1	9 18	+10.2	86 32	+15.7	43	− 6.3	153	−11.8
9 33	− 5.5	87 03	0.0	9 28	+10.3	90 00		44	− 6.4	156	−11.9
9 44		90 00		9 39				46		158	

When an observed altitude, or the height of eye, corresponds exactly to a printed value, use the upper of the two possible corrections. For Venus, Mars, and the Sun's lower limb, apply also the additional corrections on the daily pages. For the Moon, see back cover. For the Sun's upper limb, and bubble sextant observations, see page 250.

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THE AMERICAN NAUTICAL ALMANAC

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FOR THE YEAR
1951

ISSUED BY THE NAUTICAL ALMANAC OFFICE
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*On leave of absence

April 1949

PREFACE

This volume of the *American Nautical Almanac* was prepared under the immediate supervision of G. M. Clemence. The nature and arrangement of the material are the same as in the volume for 1950.

The object of the volume is to provide in convenient form the astronomical data required by mariners; that is, the Greenwich hour angle and declination of the celestial bodies used in navigation. These can always be found with two openings of the book, one (in the white section) for the hour and the other (in the yellow section) for the minute of observation. Each result is obtained as the sum of two or of three quantities, without interpolation.

The altitude corrections are obtained without interpolation; and the parallax and semidiameter of the Moon are not needed.

An explanation of the use of the *Almanac* is given near the end of the white section. This is followed by tables for finding the latitude by Polaris.

Guy Wheeler Clark,
Captain, U. S. Navy,
Superintendent Naval Observatory.

Washington, *April 1949.*

G.C.T.	♈ GHA	VENUS −3.4 GHA	VENUS Dec.	MARS 1.3 GHA	MARS Dec.	JUPITER −1.8 GHA	JUPITER Dec.	SATURN 1.1 GHA	SATURN Dec.	MOON GHA	code	MOON Dec.	code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
0	99 50.2	166 33.2	−22 53.4	143 59.4	−18 01.8	122 53.6	−10 47.3	276 52.2	+ 1 10.8	273 53.0	136	− 4 01.2	−160
1	114 52.7	181 32.3	53.0	158 59.9	01.2	137 55.6	47.1	291 54.7	10.8	288 25.6	136	4 17.2	−159
2	129 55.2	196 31.4	52.6	174 00.3	00.6	152 57.6	46.9	306 57.1	10.8	302 58.2	135	4 33.1	−160
3	144 57.6	211 30.5	·· 52.2	189 00.8	·18 00.1	167 59.7	·· 46.8	321 59.5	·· 10.7	317 30.7	134	· 4 49.1	−159
4	160 00.1	226 29.6	51.7	204 01.3	17 59.5	183 01.7	46.6	337 01.9	10.7	332 03.1	134	5 05.0	−160
5	175 02.6	241 28.6	51.3	219 01.8	58.9	198 03.7	46.4	352 04.3	10.7	346 35.5	133	5 21.0	−159
6	190 05.0	256 27.7	−22 50.9	234 02.3	−17 58.3	213 05.7	−10 46.2	7 06.7	+ 1 10.7	1 07.8	133	− 5 36.9	−159
7	205 07.5	271 26.8	50.4	249 02.8	57.8	228 07.8	46.1	22 09.1	10.7	15 40.1	132	5 52.8	−159
8	220 10.0	286 25.9	50.0	264 03.3	57.2	243 09.8	45.9	37 11.5	10.7	30 12.3	131	6 08.7	−159
9	235 12.4	301 25.0	·· 49.6	279 03.8	·· 56.6	258 11.8	·· 45.7	52 14.0	·· 10.7	44 44.4	131	· 6 24.6	−159
10	250 14.9	316 24.1	49.1	294 04.3	56.0	273 13.8	45.5	67 16.4	10.7	59 16.5	130	6 40.5	−159
11	265 17.4	331 23.2	48.7	309 04.7	55.4	288 15.8	45.4	82 18.8	10.7	73 48.5	129	6 56.4	−159
12	280 19.8	346 22.3	−22 48.2	324 05.2	−17 54.9	303 17.9	−10 45.2	97 21.2	+ 1 10.7	88 20.4	129	− 7 12.3	−158
13	295 22.3	1 21.4	47.8	339 05.7	54.3	318 19.9	45.0	112 23.6	10.7	102 52.3	128	7 28.1	−158
14	310 24.7	16 20.5	47.4	354 06.2	53.7	333 21.9	44.8	127 26.0	10.7	117 24.1	127	7 43.9	−159
15	325 27.2	31 19.6	·· 46.9	9 06.7	·· 53.1	348 23.9	·· 44.7	142 28.5	·· 10.6	131 55.8	127	· 7 59.8	−158
16	340 29.7	46 18.7	46.5	24 07.2	52.5	3 26.0	44.5	157 30.9	10.6	146 27.5	125	8 15.6	−157
17	355 32.1	61 17.8	46.0	39 07.7	52.0	18 28.0	44.3	172 33.3	10.6	160 59.0	125	8 31.3	−158
18	10 34.6	76 16.9	−22 45.6	54 08.2	−17 51.4	33 30.0	−10 44.1	187 35.7	+ 1 10.6	175 30.5	125	− 8 47.1	−157
19	25 37.1	91 15.9	45.1	69 08.7	50.8	48 32.0	44.0	202 38.1	10.6	190 02.0	123	9 02.8	−157
20	40 39.5	106 15.0	44.7	84 09.2	50.2	63 34.0	43.8	217 40.5	10.6	204 33.3	122	9 18.5	−157
21	55 42.0	121 14.1	·· 44.2	99 09.7	·· 49.6	78 36.1	·· 43.6	232 42.9	·· 10.6	219 04.5	122	· 9 34.2	−156
22	70 44.5	136 13.2	43.8	114 10.1	49.1	93 38.1	43.4	247 45.4	10.6	233 35.7	121	9 49.8	−156
23	85 46.9	151 12.3	43.3	129 10.6	48.5	108 40.1	43.2	262 47.8	10.6	248 06.8	120	10 05.4	−156
0	100 49.4	166 11.4	−22 42.9	144 11.1	−17 47.9	123 42.1	−10 43.1	277 50.2	+ 1 10.6	262 37.8	119	−10 21.0	−155
1	115 51.8	181 10.5	42.4	159 11.6	47.3	138 44.2	42.9	292 52.6	10.6	277 08.7	119	10 36.5	−155
2	130 54.3	196 09.6	41.9	174 12.1	46.7	153 46.2	42.7	307 55.0	10.6	291 39.6	117	10 52.0	−155
3	145 56.8	211 08.7	·· 41.5	189 12.6	·· 46.1	168 48.2	·· 42.5	322 57.5	·· 10.6	306 10.3	117	·11 07.5	−154
4	160 59.2	226 07.8	41.0	204 13.1	45.6	183 50.2	42.4	337 59.9	10.5	320 41.0	115	11 22.9	−154
5	176 01.7	241 06.9	40.6	219 13.6	45.0	198 52.2	42.2	353 02.3	10.5	335 11.5	115	11 38.3	−154
6	191 04.2	256 06.0	−22 40.1	234 14.1	−17 44.4	213 54.3	−10 42.0	8 04.7	+ 1 10.5	349 42.0	113	−11 53.7	−153
7	206 06.6	271 05.1	39.6	249 14.6	43.8	228 56.3	41.8	23 07.1	10.5	4 12.3	113	12 09.0	−152
8	221 09.1	286 04.2	39.2	264 15.1	43.2	243 58.3	41.7	38 09.5	10.5	18 42.6	112	12 24.2	−152
9	236 11.6	301 03.3	·· 38.7	279 15.6	·· 42.6	259 00.3	·· 41.5	53 12.0	·· 10.5	33 12.8	110	·12 39.4	−152
10	251 14.0	316 02.4	38.2	294 16.1	42.0	274 02.3	41.3	68 14.4	10.5	47 42.8	110	12 54.6	−151
11	266 16.5	331 01.5	37.8	309 16.6	41.5	289 04.4	41.1	83 16.8	10.5	62 12.8	109	13 09.7	−151
12	281 19.0	346 00.6	−22 37.3	324 17.1	−17 40.9	304 06.4	−10 41.0	98 19.2	+ 1 10.5	76 42.7	107	−13 24.8	−150
13	296 21.4	0 59.7	36.8	339 17.5	40.3	319 08.4	40.8	113 21.6	10.5	91 12.4	107	13 39.8	−150
14	311 23.9	15 58.8	36.4	354 18.0	39.7	334 10.4	40.6	128 24.1	10.5	105 42.1	105	13 54.8	−149
15	326 26.3	30 57.9	·· 35.9	9 18.5	·· 39.1	349 12.4	·· 40.4	143 26.5	·· 10.5	120 11.6	105	·14 09.7	−148
16	341 28.8	45 57.0	35.4	24 19.0	38.5	4 14.4	40.2	158 28.9	10.5	134 41.1	103	14 24.5	−148
17	356 31.3	60 56.1	34.9	39 19.5	37.9	19 16.5	40.1	173 31.3	10.5	149 10.4	102	14 39.3	−147
18	11 33.7	75 55.2	−22 34.5	54 20.0	−17 37.3	34 18.5	−10 39.9	188 33.7	+ 1 10.5	163 39.6	101	−14 54.0	−146
19	26 36.2	90 54.4	34.0	69 20.5	36.7	49 20.5	39.7	203 36.2	10.5	178 08.7	100	15 08.6	−146
20	41 38.7	105 53.5	33.5	84 21.0	36.2	64 22.5	39.5	218 38.6	10.4	192 37.7	99	15 23.2	−145
21	56 41.1	120 52.6	·· 33.0	99 21.5	·· 35.6	79 24.5	·· 39.4	233 41.0	·· 10.4	207 06.6	98	·15 37.7	−145
22	71 43.6	135 51.7	32.6	114 22.0	35.0	94 26.6	39.2	248 43.4	10.4	221 35.4	96	15 52.2	−144
23	86 46.1	150 50.8	32.1	129 22.5	34.4	109 28.6	39.0	263 45.8	10.4	236 04.0	95	16 06.6	−143
0	101 48.5	165 49.9	−22 31.6	144 23.0	−17 33.8	124 30.6	−10 38.8	278 48.3	+ 1 10.4	250 32.5	95	−16 20.9	−142
1	116 51.0	180 49.0	31.1	159 23.5	33.2	139 32.6	38.6	293 50.7	10.4	265 01.0	92	16 35.1	−141
2	131 53.5	195 48.1	30.6	174 24.0	32.6	154 34.6	38.5	308 53.1	10.4	279 29.2	92	16 49.2	−141
3	146 55.9	210 47.2	·· 30.1	189 24.5	·· 32.0	169 36.6	·· 38.3	323 55.5	·· 10.4	293 57.4	91	·17 03.3	−140
4	161 58.4	225 46.3	29.6	204 25.0	31.4	184 38.7	38.1	338 57.9	10.4	308 25.5	89	17 17.3	−139
5	177 00.8	240 45.4	29.2	219 25.5	30.8	199 40.7	37.9	354 00.4	10.4	322 53.4	88	17 31.2	−138
6	192 03.3	255 44.5	−22 28.7	234 26.0	−17 30.2	214 42.7	−10 37.8	9 02.8	+ 1 10.4	337 21.2	86	−17 45.0	−138
7	207 05.8	270 43.6	28.2	249 26.5	29.7	229 44.7	37.6	24 05.2	10.4	351 48.8	86	17 58.8	−136
8	222 08.2	285 42.8	27.7	264 27.0	29.1	244 46.7	37.4	39 07.6	10.4	6 16.4	84	18 12.4	−136
9	237 10.7	300 41.9	·· 27.2	279 27.5	·· 28.5	259 48.7	·· 37.2	54 10.1	·· 10.4	20 43.8	83	·18 26.0	−134
10	252 13.2	315 41.0	26.7	294 28.0	27.9	274 50.8	37.0	69 12.5	10.4	35 11.1	82	18 39.4	−134
11	267 15.6	330 40.1	26.2	309 28.5	27.3	289 52.8	36.9	84 14.9	10.4	49 38.3	80	18 52.8	−132
12	282 18.1	345 39.2	−22 25.7	324 29.0	−17 26.7	304 54.8	−10 36.7	99 17.3	+ 1 10.4	64 05.3	79	−19 06.0	−132
13	297 20.6	0 38.3	25.2	339 29.5	26.1	319 56.8	36.5	114 19.8	10.4	78 32.2	78	19 19.2	−130
14	312 23.0	15 37.4	24.7	354 30.0	25.5	334 58.8	36.3	129 22.2	10.4	92 59.0	76	19 32.2	−130
15	327 25.5	30 36.5	·· 24.2	9 30.5	·· 24.9	350 00.8	·· 36.1	144 24.6	·· 10.3	107 25.6	75	·19 45.2	−128
16	342 28.0	45 35.7	23.7	24 31.0	24.3	5 02.8	36.0	159 27.0	10.3	121 52.1	74	19 58.0	−128
17	357 30.4	60 34.8	23.2	39 31.5	23.7	20 04.9	35.8	174 29.5	10.3	136 18.5	72	20 10.8	−126
18	12 32.9	75 33.9	−22 22.7	54 32.0	−17 23.1	35 06.9	−10 35.6	189 31.9	+ 1 10.3	150 44.7	71	−20 23.4	−125
19	27 35.3	90 33.0	22.2	69 32.5	22.5	50 08.9	35.4	204 34.3	10.3	165 10.8	70	20 35.9	−124
20	42 37.8	105 32.1	21.7	84 33.0	21.9	65 10.9	35.3	219 36.7	10.3	179 36.8	68	20 48.3	−123
21	57 40.3	120 31.2	·· 21.2	99 33.5	·· 21.3	80 12.9	·· 35.1	234 39.1	·· 10.3	194 02.6	67	·21 00.6	−122
22	72 42.7	135 30.3	20.7	114 34.0	20.7	95 14.9	34.9	249 41.6	10.3	208 28.3	66	21 12.8	−120
23	87 45.2	150 29.5	20.1	129 34.5	20.1	110 16.9	34.7	264 44.0	10.3	222 53.9	64	21 24.8	−119
24	102 47.7	165 28.6	−22 19.6	144 35.0	−17 19.5	125 19.0	−10 34.5	279 46.4	+ 1 10.3	237 19.3	63	−21 36.7	−118
code	—	− 9	+ 5	+ 4	+ 6	+ 20	+ 2	+ 24	0				

GCT	SUN GHA	SUN Dec.
h	° ′	° ′
0	179 13.4	−23 05.4
1	194 13.1	05.2
2	209 12.8	05.0
3	224 12.5	·· 04.8
4	239 12.2	04.6
5	254 11.9	04.4
6	269 11.6	−23 04.2
7	284 11.3	04.0
8	299 11.0	03.8
9	314 10.7	·· 03.7
10	329 10.4	03.5
11	344 10.1	03.3
12	359 09.8	−23 03.1
13	14 09.5	02.9
14	29 09.2	02.7
15	44 08.9	·· 02.5
16	59 08.6	02.3
17	74 08.3	02.1
18	89 08.0	−23 01.9
19	104 07.7	01.7
20	119 07.5	01.5
21	134 07.2	·· 01.3
22	149 06.9	01.1
23	164 06.6	00.9
0	179 06.3	−23 00.7
1	194 06.0	00.5
2	209 05.7	00.2
3	224 05.4	·23 00.0
4	239 05.1	22 59.8
5	254 04.8	59.6
6	269 04.5	−22 59.4
7	284 04.2	59.2
8	299 03.9	59.0
9	314 03.6	·· 58.8
10	329 03.3	58.6
11	344 03.0	58.3
12	359 02.7	−22 58.1
13	14 02.4	57.9
14	29 02.1	57.7
15	44 01.8	·· 57.5
16	59 01.6	57.3
17	74 01.3	57.0
18	89 01.0	−22 56.8
19	104 00.7	56.6
20	119 00.4	56.4
21	134 00.1	·· 56.2
22	148 59.8	55.9
23	163 59.5	55.7
0	178 59.2	−22 55.5
1	193 58.9	55.3
2	208 58.6	55.0
3	223 58.3	·· 54.8
4	238 58.0	54.6
5	253 57.8	54.4
6	268 57.5	−22 54.1
7	283 57.2	53.9
8	298 56.9	53.7
9	313 56.6	·· 53.4
10	328 56.3	53.2
11	343 56.0	53.0
12	358 55.7	−22 52.7
13	13 55.4	52.5
14	28 55.1	52.3
15	43 54.8	·· 52.0
16	58 54.6	51.8
17	73 54.3	51.5
18	88 54.0	−22 51.3
19	103 53.7	51.1
20	118 53.4	50.8
21	133 53.1	·· 50.6
22	148 52.8	50.3
23	163 52.5	50.1
24	178 52.2	−22 49.9
code	−	+ 2

STARS No.	SHA	Dec.	Transit Mer. Gr.
	° ′	° ′	h m
1	358 32.4	+28 49.4	17 20
2	358 22.1	+58 53.1	17 20
3	349 43.0	−18 15.4	17 55
4	339 21.2	+59 59.2	18 36
5	336 01.2	−57 29.3	18 50
6	332 39.0	+89 02.4	19 03
7	328 53.8	+23 14.1	19 18
8	315 53.6	−40 30.1	20 10
9	309 47.5	+49 41.6	20 34
10	291 43.1	+16 24.9	21 46
11	281 56.9	− 8 15.3	22 25
12	281 43.5	+45 57.2	22 26
13	279 22.1	+ 6 18.5	22 36
14	279 11.7	+28 34.3	22 36
15	276 33.8	− 1 13.8	22 47
16	271 51.9	+ 7 24.1	23 05
17	264 16.5	−52 40.0	23 36
18	259 14.8	−16 38.7	23 56
19	255 49.1	−28 54.1	0 13
20	245 48.6	+ 5 21.2	0 53
21	244 24.7	+28 08.8	0 59
22	234 36.9	−59 20.9	1 38
23	223 26.8	−43 13.8	2 23
24	221 49.4	−69 30.6	2 29
25	218 42.0	− 8 26.6	2 41
26	208 33.2	+12 12.4	3 22
27	194 48.6	+62 00.7	4 17
28	183 21.4	+14 50.6	5 02
29	174 02.2	−62 49.4	5 40
30	172 53.6	−56 50.1	5 44
31	168 47.6	−59 25.0	6 01
32	167 01.6	+56 13.2	6 08
33	159 30.5	+55 10.5	6 38
34	159 20.9	−10 54.4	6 38
35	153 35.8	+49 33.1	7 01
36	149 03.3	−36 07.7	7 19
37	146 38.7	+19 26.0	7 29
38	140 56.7	−60 38.0	7 52
39	137 17.9	+74 21.0	8 06
40	126 51.0	+26 52.4	8 48
41	120 38.8	−22 29.1	9 13
42	113 24.3	−26 19.6	9 41
43	109 09.0	−68 56.4	9 58
44	103 06.8	−15 40.1	10 23
45	97 26.2	−37 04.3	10 45
46	96 50.4	+12 35.5	10 48
47	91 08.5	+51 29.4	11 10
48	84 46.5	−34 24.7	11 36
49	81 11.3	+38 44.0	11 50
50	76 56.9	−26 21.7	12 07
51	62 54.4	+ 8 44.1	13 03
52	54 33.6	−56 53.9	13 36
53	50 04.1	+45 06.3	13 54
54	34 33.5	+ 9 38.9	14 56
55	28 42.8	−47 12.2	15 19
56	16 15.8	−29 53.1	16 09
57	14 25.4	+14 56.5	16 16

Lat.	Sunrise	Twlt. begins	Moonrise 1	Moonrise 2	Moonrise 3	Moonrise 4
N °	h m	h m	h m	h m	h m	h m
70	▬	6 46	0 33	2 47	5 38	▬
68	▬	6 39	0 28	2 31	4 57	▬
66	10 27	6 33	0 24	2 19	4 29	7 24
64	9 49	6 27	0 20	2 08	4 08	6 28
62	9 23	6 23	0 17	1 59	3 51	5 55
60	9 02	6 18	0 14	1 52	3 37	5 31
58	8 45	6 14	0 12	1 45	3 25	5 12
56	8 31	6 11	0 10	1 39	3 15	4 56
54	8 19	6 06	0 08	1 34	3 06	4 42
52	8 08	6 03	0 06	1 30	2 58	4 31
50	7 59	6 00	0 05	1 25	2 51	4 20
45	7 38	5 52	0 01	1 16	2 35	3 58
40	7 22	5 45	25 09	1 09	2 23	3 41
35	7 08	5 37	25 02	1 02	2 12	3 26
30	6 56	5 31	24 57	0 57	2 03	3 14
20	6 35	5 17	24 47	0 47	1 48	2 52
10	6 17	5 02	24 39	0 39	1 34	2 34
0	6 00	4 45	24 31	0 31	1 21	2 17
10	5 43	4 25	24 23	0 23	1 09	2 00
20	5 24	4 00	24 15	0 15	0 56	1 42
30	5 03	3 26	24 06	0 06	0 41	1 21
35	4 50	3 03	24 01	0 01	0 32	1 09
40	4 35	2 32	23 55	24 22	0 22	0 55
45	4 18	1 47	23 48	24 11	0 11	0 39
50	3 56	////	23 40	23 57	24 20	0 20
52	3 45	////	23 36	23 51	24 10	0 10
54	3 33	////	23 32	23 44	24 00	0 00
56	3 19	////	23 28	23 36	23 48	24 09
58	3 03	////	23 23	23 27	23 35	23 50
60	2 43	////	23 17	23 17	23 19	23 26
S						

Lat.	Sunset	Twlt. ends	Moonset 1	Moonset 2	Moonset 3	Moonset 4
N °	h m	h m	h m	h m	h m	h m
70	▬	17 21	10 45	10 10	9 07	▬
68	▬	17 28	10 53	10 28	9 50	▬
66	13 41	17 35	11 00	10 43	10 19	9 21
64	14 19	17 41	11 06	10 55	10 42	10 19
62	14 45	17 45	11 11	11 05	11 00	10 52
60	15 06	17 50	11 15	11 14	11 15	11 17
58	15 22	17 53	11 19	11 22	11 27	11 37
56	15 37	17 58	11 22	11 29	11 39	11 54
54	15 49	18 01	11 25	11 35	11 48	12 08
52	16 00	18 05	11 28	11 41	11 57	12 20
50	16 09	18 08	11 31	11 46	12 05	12 31
45	16 29	18 15	11 36	11 57	12 22	12 54
40	16 46	18 23	11 41	12 06	12 36	13 13
35	17 00	18 30	11 45	12 14	12 48	13 29
30	17 12	18 37	11 49	12 21	12 58	13 43
20	17 32	18 50	11 55	12 34	13 16	14 06
10	17 51	19 06	12 01	12 44	13 32	14 26
0	18 08	19 23	12 06	12 54	13 47	14 45
10	18 25	19 42	12 12	13 04	14 02	15 04
20	18 43	20 07	12 17	13 15	14 18	15 25
30	19 05	20 41	12 24	13 28	14 36	15 48
35	19 17	21 03	12 27	13 35	14 47	16 02
40	19 32	21 34	12 32	13 44	15 00	16 19
45	19 50	22 20	12 37	13 53	15 14	16 38
50	20 11	////	12 43	14 05	15 32	17 03
52	20 22	////	12 45	14 11	15 41	17 14
54	20 34	////	12 48	14 17	15 51	17 28
56	20 48	////	12 52	14 24	16 02	17 44
58	21 04	////	12 56	14 31	16 14	18 03
60	21 23	////	13 00	14 40	16 29	18 26
S						

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb	Venus	Mars
°	′	′	′
0			
	0.6	0.1	0.1
30			
	0.6	0.1	0.1
45			
	0.6	0.1	0.0
60			
	0.6	0.0	0.0
75			
	0.6	0.0	0.0
90			

Moon's Lower Limb
Add

Alt.	1	2	3
°	′	′	′
0			
	17.2	18.2	19.1
4			
	17.2	18.2	19.1
8			
	17.2	18.2	19.1
12			
	17.2	18.2	19.0
16			
	17.1	18.1	19.0
20			
	17.1	18.1	18.9
24			
	17.1	18.0	18.8
28			
	17.0	17.9	18.7
32			
	17.0	17.9	18.6
36			
	16.9	17.8	18.5
40			
	16.9	17.7	18.4
44			
	16.8	17.6	18.3
48			
	16.7	17.5	18.1
52			
	16.7	17.4	18.0
56			
	16.6	17.2	17.8
60			
	16.5	17.1	17.6
64			
	16.4	17.0	17.5
68			
	16.4	16.8	17.3
72			
	16.3	16.7	17.1
76			
	16.2	16.6	16.9
80			
	16.1	16.4	16.7
84			
	16.0	16.3	16.5
88			
	15.9	16.2	16.4
90			

Add to table, back cover

Moon's Upper Limb
Subtract

Alt.	1	2	3
°	′	′	′
0			
	14.6	14.0	13.5
4			
	14.6	14.0	13.5
8			
	14.6	14.1	13.6
12			
	14.6	14.1	13.6
16			
	14.7	14.1	13.6
20			
	14.7	14.2	13.7
24			
	14.7	14.2	13.8
28			
	14.8	14.3	13.9
32			
	14.8	14.4	14.0
36			
	14.9	14.5	14.1
40			
	14.9	14.6	14.2
44			
	15.0	14.7	14.4
48			
	15.1	14.8	14.5
52			
	15.1	14.9	14.7
56			
	15.2	15.0	14.8
60			
	15.3	15.1	15.0
64			
	15.4	15.3	15.2
68			
	15.5	15.4	15.4
72			
	15.5	15.5	15.5
76			
	15.6	15.7	15.7
80			
	15.7	15.8	15.9
84			
	15.8	16.0	16.1
88			
	15.9	16.1	16.3
90			

Subtract from table, back cover

GCT	Equation of Time (App.—Mean) 1	2	3
h	m s	m s	m s
0	− 3 05.8	− 3 34.3	− 4 02.6
6	− 3 13.0	− 3 41.4	− 4 09.6
12	− 3 20.1	− 3 48.5	− 4 16.6
18	− 3 27.2	− 3 55.5	− 4 23.5
24	− 3 34.3	− 4 02.6	− 4 30.5

GCT of Transit Meridian of Greenwich

DAY	Moon	Venus	Mars	Jupiter	Saturn
	h m	h m	h m	h m	h m
1	5 55	12 55	14 24	15 46	5 32
2	6 43	12 56	14 23	15 43	5 28
3	7 34	12 57	14 22	15 40	5 24
4	8 31	12 59	14 21	15 37	5 20

New Year's Day 1
Last Quarter 1

G C T	♈	VENUS −3.4		MARS 1.4		JUPITER −1.8		SATURN 1.1		MOON			
	GHA	GHA	Dec.	GHA	Dec.	GHA	Dec.	GHA	Dec.	GHA	code	Dec.	code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
0	102 47.7	165 28.6	−22 19.6	144 35.0	−17 19.5	125 19.0	−10 34.5	279 46.4	+ 1 10.3	237 19.3	63	−21 36.7	−118
1	117 50.1	180 27.7	19.1	159 35.5	18.9	140 21.0	34.4	294 48.9	10.3	251 44.6	62	21 48.5	−117
2	132 52.6	195 26.8	18.6	174 36.0	18.3	155 23.0	34.2	309 51.3	10.3	266 09.8	60	22 00.2	−115
3	147 55.1	210 25.9	•• 18.1	189 36.5	•• 17.7	170 25.0	•• 34.0	324 53.7	•• 10.3	280 34.8	59	•22 11.7	−114
4	162 57.5	225 25.0	17.6	204 37.0	17.1	185 27.0	33.8	339 56.1	10.3	294 59.7	58	22 23.1	−113
5	178 00.0	240 24.2	17.1	219 37.5	16.5	200 29.0	33.6	354 58.6	10.3	309 24.5	56	22 34.4	−111
6	193 02.4	255 23.3	−22 16.5	234 38.0	−17 15.9	215 31.0	−10 33.5	10 01.0	+ 1 10.3	323 49.1	55	−22 45.5	−110
7	208 04.9	270 22.4	16.0	249 38.5	15.3	230 33.1	33.3	25 03.4	10.3	338 13.6	53	22 56.5	−108
8	223 07.4	285 21.5	15.5	264 39.0	14.7	245 35.1	33.1	40 05.8	10.3	352 37.9	52	23 07.3	−107
9	238 09.8	300 20.6	•• 15.0	279 39.5	•• 14.1	260 37.1	•• 32.9	55 08.3	•• 10.3	7 02.1	51	•23 18.0	−106
10	253 12.3	315 19.8	14.4	294 40.0	13.5	275 39.1	32.7	70 10.7	10.3	21 26.2	50	23 28.6	−104
11	268 14.8	330 18.9	13.9	309 40.5	12.9	290 41.1	32.6	85 13.1	10.3	35 50.2	48	23 39.0	−102
12	283 17.2	345 18.0	−22 13.4	324 41.0	−17 12.3	305 43.1	−10 32.4	100 15.5	+ 1 10.3	50 14.0	47	−23 49.2	−101
13	298 19.7	0 17.1	12.9	339 41.5	11.7	320 45.1	32.2	115 18.0	10.3	64 37.7	45	23 59.3	− 99
14	313 22.2	15 16.3	12.3	354 42.0	11.1	335 47.1	32.0	130 20.4	10.3	79 01.2	45	24 09.2	− 98
15	328 24.6	30 15.4	•• 11.8	9 42.5	•• 10.5	350 49.1	•• 31.8	145 22.8	•• 10.3	93 24.7	43	•24 19.0	− 96
16	343 27.1	45 14.5	11.3	24 43.0	09.9	5 51.2	31.7	160 25.3	10.3	107 48.0	41	24 28.6	− 95
17	358 29.6	60 13.6	10.7	39 43.5	09.3	20 53.2	31.5	175 27.7	10.3	122 11.1	41	24 38.1	− 93
18	13 32.0	75 12.7	−22 10.2	54 44.0	−17 08.7	35 55.2	−10 31.3	190 30.1	+ 1 10.3	136 34.2	39	−24 47.4	− 91
19	28 34.5	90 11.9	09.7	69 44.5	08.1	50 57.2	31.1	205 32.5	10.3	150 57.1	38	24 56.5	− 90
20	43 36.9	105 11.0	09.1	84 45.0	07.5	65 59.2	30.9	220 35.0	10.3	165 19.9	36	25 05.5	− 88
21	58 39.4	120 10.1	•• 08.6	99 45.5	•• 06.9	81 01.2	•• 30.7	235 37.4	•• 10.2	179 42.5	36	•25 14.3	− 86
22	73 41.9	135 09.3	08.1	114 46.0	06.3	96 03.2	30.6	250 39.8	10.2	194 05.1	34	25 22.9	− 85
23	88 44.3	150 08.4	07.5	129 46.6	05.7	111 05.2	30.4	265 42.3	10.2	208 27.5	33	25 31.4	− 82
0	103 46.8	165 07.5	−22 07.0	144 47.1	−17 05.1	126 07.2	−10 30.2	280 44.7	+ 1 10.2	222 49.8	32	−25 39.6	− 81
1	118 49.3	180 06.6	06.5	159 47.6	04.5	141 09.3	30.0	295 47.1	10.2	237 12.0	30	25 47.7	− 79
2	133 51.7	195 05.8	05.9	174 48.1	03.9	156 11.3	29.8	310 49.5	10.2	251 34.0	30	25 55.6	− 77
3	148 54.2	210 04.9	•• 05.4	189 48.6	•• 03.2	171 13.3	•• 29.7	325 52.0	•• 10.2	265 56.0	28	•26 03.3	− 76
4	163 56.7	225 04.0	04.8	204 49.1	02.6	186 15.3	29.5	340 54.4	10.2	280 17.8	27	26 10.9	− 73
5	178 59.1	240 03.1	04.3	219 49.6	02.0	201 17.3	29.3	355 56.8	10.2	294 39.5	26	26 18.2	− 72
6	194 01.6	255 02.3	−22 03.7	234 50.1	−17 01.4	216 19.3	−10 29.1	10 59.3	+ 1 10.2	309 01.1	26	−26 25.4	− 70
7	209 04.1	270 01.4	03.2	249 50.6	00.8	231 21.3	28.9	26 01.7	10.2	323 22.7	24	26 32.4	− 68
8	224 06.5	285 00.5	02.6	264 51.1	17 00.2	246 23.3	28.8	41 04.1	10.2	337 44.1	23	26 39.2	− 66
9	239 09.0	299 59.7	•• 02.1	279 51.6	•16 59.6	261 25.3	•• 28.6	56 06.6	•• 10.2	352 05.4	22	•26 45.8	− 63
10	254 114	314 58.8	01.5	294 52.1	59.0	276 27.3	28.4	71 09.0	10.2	6 26.6	21	26 52.1	− 62
11	269 13.9	329 57.9	01.0	309 52.6	58.4	291 29.3	28.2	86 11.4	10.2	20 47.7	20	26 58.3	− 60
12	284 16.4	344 57.1	−22 00.4	324 53.1	−16 57.8	306 31.3	−10 28.0	101 13.9	+ 1 10.2	35 08.7	19	−27 04.3	− 58
13	299 18.8	359 56.2	21 59.9	339 53.6	57.2	321 33.4	27.8	116 16.3	10.2	49 29.6	19	27 10.1	− 56
14	314 21.3	14 55.3	59.3	354 54.2	56.5	336 35.4	27.7	131 18.7	10.2	63 50.5	17	27 15.7	− 54
15	329 23.8	29 54.5	•• 58.8	9 54.7	•• 55.9	351 37.4	•• 27.5	146 21.2	•• 10.2	78 11.2	17	•27 21.1	− 52
16	344 26.2	44 53.6	58.2	24 55.2	55.3	6 39.4	27.3	161 23.6	10.2	92 31.9	15	27 26.3	− 50
17	359 28.7	59 52.7	57.6	39 55.7	54.7	21 41.4	27.1	176 26.0	10.2	106 52.4	15	27 31.3	− 48
18	14 31.2	74 51.9	−21 57.1	54 56.2	−16 54.1	36 43.4	−10 26.9	191 28.4	+ 1 10.2	121 12.9	15	−27 36.1	− 45
19	29 33.6	89 51.0	56.5	69 56.7	53.5	51 45.4	26.8	206 30.9	10.2	135 33.4	13	27 40.6	− 44
20	44 36.1	104 50.1	56.0	84 57.2	52.9	66 47.4	26.6	221 33.3	10.2	149 53.7	13	27 45.0	− 41
21	59 38.6	119 49.3	•• 55.4	99 57.7	•• 52.3	81 49.4	•• 26.4	236 35.7	•• 10.2	164 14.0	12	•27 49.1	− 39
22	74 41.0	134 48.4	54.8	114 58.2	51.7	96 51.4	26.2	251 38.2	10.2	178 34.2	12	27 53.0	− 38
23	89 43.5	149 47.6	54.3	129 58.7	51.0	111 53.4	26.0	266 40.6	10.2	192 54.4	11	27 56.8	− 34
0	104 45.9	164 46.7	−21 53.7	144 59.3	−16 50.4	126 55.4	−10 25.8	281 43.1	+ 1 10.2	207 14.5	10	−28 00.2	− 33
1	119 48.4	179 45.8	53.1	159 59.8	49.8	141 57.4	25.7	296 45.5	10.2	221 34.5	10	28 03.5	− 31
2	134 50.9	194 45.0	52.6	175 00.3	49.2	156 59.4	25.5	311 47.9	10.2	235 54.5	9	28 06.6	− 28
3	149 53.3	209 44.1	•• 52.0	190 00.8	•• 48.6	172 01.5	•• 25.3	326 50.4	•• 10.2	250 14.4	9	•28 09.4	− 27
4	164 55.8	224 43.3	51.4	205 01.3	48.0	187 03.5	25.1	341 52.8	10.2	264 34.3	9	28 12.1	− 24
5	179 58.3	239 42.4	50.8	220 01.8	47.4	202 05.5	24.9	356 55.2	10.2	278 54.2	8	28 14.5	− 22
6	195 00.7	254 41.5	−21 50.3	235 02.3	−16 46.7	217 07.5	−10 24.7	11 57.7	+ 1 10.2	293 14.0	8	−28 16.7	− 19
7	210 03.2	269 40.7	49.7	250 02.8	46.1	232 09.5	24.6	27 00.1	10.2	307 33.8	7	28 18.6	− 18
8	225 05.7	284 39.8	49.1	265 03.3	45.5	247 11.5	24.4	42 02.5	10.2	321 53.5	7	28 20.4	− 15
9	240 08.1	299 39.0	•• 48.5	280 03.8	•• 44.9	262 13.5	•• 24.2	57 05.0	•• 10.2	336 13.2	7	•28 21.9	− 13
10	255 10.6	314 38.1	48.0	295 04.4	44.3	277 15.5	24.0	72 07.4	10.2	350 32.9	7	28 23.2	− 11
11	270 13.1	329 37.2	47.4	310 04.9	43.7	292 17.5	23.8	87 09.8	10.2	4 52.6	7	28 24.3	− 8
12	285 15.5	344 36.4	−21 46.8	325 05.4	−16 43.0	307 19.5	−10 23.6	102 12.3	+ 1 10.2	19 12.3	6	−28 25.1	− 6
13	300 18.0	359 35.5	46.2	340 05.9	42.4	322 21.5	23.5	117 14.7	10.2	33 31.9	6	28 25.7	− 4
14	315 20.4	14 34.7	45.6	355 06.4	41.8	337 23.5	23.3	132 17.1	10.2	47 51.5	7	28 26.1	− 2
15	330 22.9	29 33.8	•• 45.1	10 06.9	•• 41.2	352 25.5	•• 23.1	147 19.6	•• 10.2	62 11.2	6	•28 26.3	0
16	345 25.4	44 33.0	44.5	25 07.4	40.6	7 27.5	22.9	162 22.0	10.2	76 30.8	6	28 26.3	+ 3
17	0 27.8	59 32.1	43.9	40 08.0	40.0	22 29.5	22.7	177 24.5	10.2	90 50.4	7	28 26.0	+ 5
18	15 30.3	74 31.3	−21 43.3	55 08.5	−16 39.3	37 31.5	−10 22.5	192 26.9	+ 1 10.2	105 10.1	6	−28 25.5	+ 7
19	30 32.8	89 30.4	42.7	70 09.0	38.7	52 33.5	22.4	207 29.3	10.2	119 29.7	7	28 24.8	+ 9
20	45 35.2	104 29.6	42.1	85 09.5	38.1	67 35.5	22.2	222 31.8	10.2	133 49.4	7	28 23.9	+ 12
21	60 37.7	119 28.7	•• 41.5	100 10.0	•• 37.5	82 37.5	•• 22.0	237 34.2	•• 10.2	148 09.1	7	•28 22.7	+ 14
22	75 40.2	134 27.9	40.9	115 10.5	36.9	97 39.5	21.8	252 36.6	10.2	162 28.8	7	28 21.3	+ 16
23	90 42.6	149 27.0	40.3	130 11.0	36.2	112 41.5	21.6	267 39.1	10.2	176 48.5	8	28 19.7	+ 18
24	105 45.1	164 26.2	−21 39.7	145 11.6	−16 35.6	127 43.5	−10 21.4	282 41.5	+ 1 10.2	191 08.3	7	−28 17.9	+ 20
code	—	− 9	+ 5	+ 5	+ 6	+ 21	+ 2	+ 24	0				

GCT h	SUN GHA ° ′	SUN Dec. ° ′
0	178 52.2	−22 49.9
1	193 52.0	49.6
2	208 51.7	49.4
3	223 51.4	•• 49.1
4	238 51.1	48.9
5	253 50.8	48.6
6	268 50.5	−22 48.4
7	283 50.2	48.1
8	298 49.9	47.9
9	313 49.7	•• 47.6
10	328 49.4	47.4
11	343 49.1	47.1
12	358 48.8	−22 46.9
13	13 48.5	46.6
14	28 48.2	46.4
15	43 47.9	•• 46.1
16	58 47.6	45.9
17	73 47.4	45.6
18	88 47.1	−22 45.3
19	103 46.8	45.1
20	118 46.5	44.8
21	133 46.2	•• 44.6
22	148 45.9	44.3
23	163 45.6	44.0
0	178 45.4	−22 43.8
1	193 45.1	43.5
2	208 44.8	43.3
3	223 44.5	•• 43.0
4	238 44.2	42.7
5	253 43.9	42.5
6	268 43.7	−22 42.2
7	283 43.4	41.9
8	298 43.1	41.7
9	313 42.8	•• 41.4
10	328 42.5	41.1
11	343 42.2	40.8
12	358 42.0	−22 40.6
13	13 41.7	40.3
14	28 41.4	40.0
15	43 41.1	•• 39.7
16	58 40.8	39.5
17	73 40.5	39.2
18	88 40.3	−22 38.9
19	103 40.0	38.6
20	118 39.7	38.4
21	133 39.4	•• 38.1
22	148 39.1	37.8
23	163 38.9	37.5
0	178 38.6	−22 37.2
1	193 38.3	37.0
2	208 38.0	36.7
3	223 37.7	•• 36.4
4	238 37.5	36.1
5	253 37.2	35.8
6	268 36.9	−22 35.5
7	283 36.6	35.3
8	298 36.3	35.0
9	313 36.1	•• 34.7
10	328 35.8	34.4
11	343 35.5	34.1
12	358 35.2	−22 33.8
13	13 34.9	33.5
14	28 34.7	33.2
15	43 34.4	•• 32.9
16	58 34.1	32.6
17	73 33.8	32.3
18	88 33.6	−22 32.0
19	103 33.3	31.8
20	118 33.0	31.5
21	133 32.7	•• 31.2
22	148 32.5	30.9
23	163 32.2	30.6
24	178 31.9	−22 30.3
code	—	+ 3

STARS No.	SHA ° ′	Dec. ° ′	Transit Mer. Gr. h m
1	358 32.4	+28 49.4	17 08
2	358 22.1	+58 53.1	17 09
3	349 43.0	−18 15.4	17 43
4	339 21.2	+59 59.2	18 24
5	336 01.3	−57 29.3	18 38
6	332 39.9	+89 02.4	18 51
7	328 53.8	+23 14.1	19 06
8	315 53.6	−40 30.1	19 58
9	309 47.5	+49 41.6	20 22
10	291 43.1	+16 24.9	21 34
11	281 56.9	− 8 15.3	22 13
12	281 43.5	+45 57.3	22 14
13	279 22.1	+ 6 18.5	22 24
14	279 11.7	+28 34.3	22 24
15	276 33.7	− 1 13.8	22 35
16	271 51.8	+ 7 24.1	22 54
17	264 16.5	−52 40.0	23 24
18	259 14.8	−16 38.7	23 44
19	255 49.1	−28 54.1	0 02
20	245 48.6	+ 5 21.2	0 42
21	244 24.7	+28 08.8	0 47
22	234 36.9	−59 20.9	1 26
23	223 26.8	−43 13.8	2 11
24	221 49.4	−69 30.7	2 17
25	218 42.0	− 8 26.7	2 30
26	208 33.2	+12 12.4	3 10
27	194 48.5	+62 00.7	4 05
28	183 21.4	+14 50.6	4 51
29	174 02.2	−62 49.4	5 28
30	172 53.6	−56 50.1	5 32
31	168 47.5	−59 25.0	5 49
32	167 01.6	+56 13.2	5 56
33	159 30.5	+55 10.5	6 26
34	159 20.9	−10 54.4	6 26
35	153 35.8	+49 33.1	6 49
36	149 03.3	−36 07.7	7 07
37	146 38.7	+19 26.0	7 17
38	140 56.6	−60 38.0	7 40
39	137 17.9	+74 20.9	7 54
40	126 51.0	+26 52.4	8 36
41	120 38.8	−22 29.1	9 01
42	113 24.3	−26 19.6	9 30
43	109 09.0	−68 56.4	9 47
44	103 06.8	−15 40.1	10 11
45	97 26.2	−37 04.3	10 33
46	96 50.4	+12 35.5	10 36
47	91 08.5	+51 29.4	10 59
48	84 46.5	−34 24.7	11 24
49	81 11.2	+38 44.0	11 38
50	76 56.9	−26 21.7	11 55
51	62 54.4	+ 8 44.1	12 51
52	54 33.6	−56 53.9	13 24
53	50 04.1	+45 06.3	13 42
54	34 33.6	+ 9 38.9	14 44
55	28 42.8	−47 12.2	15 08
56	16 15.8	−29 53.1	15 57
57	14 25.4	+14 56.5	16 05

Lat. °	Sunrise h m	Twlt. begins h m	Moonrise 4 h m	Moonrise 5 h m	Moonrise 6 h m	Moonrise 7 h m
N 70	■	6 44	■	■	■	■
68	11 35	6 38	■	■	■	■
66	10 21	6 33	7 24	■	■	■
64	9 46	6 27	6 28	■	■	■
62	9 20	6 22	5 55	8 19	■	11 22
60	9 00	6 18	5 31	7 32	9 17	10 10
58	8 44	6 14	5 12	7 01	8 36	9 34
56	8 30	6 10	4 56	6 38	8 07	9 08
54	8 18	6 07	4 42	6 20	7 45	8 48
52	8 08	6 03	4 31	6 04	7 27	8 30
50	7 58	6 00	4 20	5 50	7 12	8 16
45	7 38	5 52	3 58	5 22	6 41	7 46
40	7 22	5 45	3 41	5 01	6 16	7 22
35	7 09	5 38	3 26	4 43	5 56	7 03
30	6 57	5 32	3 14	4 27	5 39	6 46
20	6 36	5 18	2 52	4 01	5 11	6 18
10	6 18	5 03	2 34	3 39	4 46	5 54
0	6 02	4 46	2 17	3 18	4 24	5 31
10	5 44	4 27	2 00	2 57	4 01	5 08
20	5 26	4 02	1 42	2 35	3 37	4 44
30	5 05	3 29	1 21	2 10	3 08	4 16
35	4 52	3 05	1 09	1 55	2 52	3 59
40	4 38	2 36	0 55	1 38	2 32	3 40
45	4 20	1 51	0 39	1 17	2 09	3 16
50	3 59	////	0 20	0 52	1 39	2 46
52	3 49	////	0 10	0 39	1 24	2 31
54	3 37	////	0 00	0 25	1 07	2 13
56	3 23	////	24 09	0 09	0 47	1 52
58	3 08	////	23 50	24 21	0 21	1 25
60	2 49	////	23 26	23 47	24 47	0 47
S						

Lat. °	Sunset h m	Twlt. ends h m	Moonset 4 h m	Moonset 5 h m	Moonset 6 h m	Moonset 7 h m
N 70	■	17 27	■	■	■	■
68	12 36	17 34	■	■	■	■
66	13 49	17 39	9 21	■	■	■
64	14 25	17 44	10 19	■	■	■
62	14 51	17 49	10 52	10 39	■	12 18
60	15 10	17 53	11 17	11 27	12 00	13 30
58	15 27	17 57	11 37	11 57	12 42	14 05
56	15 41	18 01	11 54	12 21	13 11	14 30
54	15 53	18 05	12 08	12 40	13 33	14 51
52	16 03	18 08	12 20	12 56	13 51	15 08
50	16 13	18 11	12 31	13 10	14 07	15 22
45	16 32	18 18	12 54	13 39	14 38	15 52
40	16 48	18 25	13 13	14 01	15 02	16 15
35	17 02	18 32	13 29	14 20	15 22	16 34
30	17 14	18 39	13 43	14 36	15 39	16 50
20	17 34	18 52	14 06	15 03	16 08	17 17
10	17 52	19 07	14 26	15 27	16 33	17 41
0	18 09	19 24	14 45	15 49	16 56	18 03
10	18 26	19 43	15 04	16 11	17 19	18 24
20	18 44	20 07	15 25	16 34	17 43	18 47
30	19 05	20 40	15 48	17 02	18 12	19 14
35	19 18	21 03	16 02	17 18	18 29	19 30
40	19 32	21 33	16 19	17 37	18 48	19 48
45	19 49	22 16	16 38	18 00	19 12	20 10
50	20 11	////	17 03	18 29	19 43	20 37
52	20 21	////	17 14	18 44	19 58	20 50
54	20 33	////	17 28	19 01	20 16	21 06
56	20 46	////	17 44	19 21	20 37	21 24
58	21 02	////	18 03	19 46	21 04	21 46
60	21 21	////	18 26	20 21	21 42	22 13
S						

GCT h	Equation of Time (App.—Mean) 4 m s	5 m s	6 m s
0	− 4 30.5	− 4 58.0	− 5 25.1
6	− 4 37.4	− 5 04.8	− 5 31.8
12	− 4 44.3	− 5 11.6	− 5 38.5
18	− 4 51.1	− 5 18.4	− 5 45.2
24	− 4 58.0	− 5 25.1	− 5 51.8

GCT of Transit Meridian of Greenwich

DAY	Moon h m	Venus h m	Mars h m	Jupiter h m	Saturn h m
4	8 31	12 59	14 21	15 37	5 20
5	9 33	13 00	14 20	15 33	5 16
6	10 40	13 02	14 20	15 30	5 12
7	11 47	13 03	14 19	15 27	5 08

ADDITIONAL ALTITUDE CORRECTIONS

Alt. °	Sun's Low'r Limb ′	Venus ′	Mars ′
0			
	0.6	0.1	0.1
30			
	0.6	0.1	0.1
45			
	0.6	0.1	0.0
60			
	0.6	0.0	0.0
75			
	0.6	0.0	0.0
90			

Moon's Lower Limb *Add*

Alt. °	4 ′	5 ′	6 ′
0			
	19.9	20.4	20.6
4			
	19.9	20.4	20.6
8			
	19.8	20.3	20.6
12			
	19.8	20.3	20.5
16			
	19.7	20.2	20.4
20			
	19.6	20.1	20.4
24			
	19.5	20.0	20.2
28			
	19.4	19.9	20.1
32			
	19.3	19.7	20.0
36			
	19.2	19.6	19.8
40			
	19.0	19.4	19.6
44			
	18.8	19.2	19.4
48			
	18.7	19.0	19.2
52			
	18.5	18.8	19.0
56			
	18.3	18.6	18.8
60			
	18.1	18.4	18.5
64			
	17.9	18.1	18.3
68			
	17.6	17.9	18.0
72			
	17.4	17.6	17.7
76			
	17.2	17.4	17.5
80			
	17.0	17.1	17.2
84			
	16.7	16.9	16.9
88			
	16.5	16.7	16.7
90			

Add to table, back cover

Moon's Upper Limb *Subtract*

Alt. °	4 ′	5 ′	6 ′
0			
	13.1	12.8	12.6
4			
	13.1	12.8	12.7
8			
	13.1	12.8	12.7
12			
	13.2	12.9	12.8
16			
	13.2	13.0	12.8
20			
	13.3	13.1	12.9
24			
	13.4	13.2	13.0
28			
	13.5	13.3	13.2
32			
	13.7	13.4	13.3
36			
	13.8	13.6	13.5
40			
	13.9	13.8	13.7
44			
	14.1	13.9	13.9
48			
	14.3	14.1	14.1
52			
	14.5	14.3	14.3
56			
	14.7	14.6	14.5
60			
	14.9	14.8	14.8
64			
	15.1	15.0	15.0
68			
	15.3	15.3	15.3
72			
	15.5	15.5	15.5
76			
	15.8	15.8	15.8
80			
	16.0	16.1	16.1
84			
	16.2	16.3	16.4
88			
	16.4	16.5	16.6
90			

Subtract from table, back cover

Epiphany 6

G C T	♈ GHA	VENUS −3.4 GHA	Dec.	MARS 1.4 GHA	Dec.	JUPITER −1.7 GHA	Dec.	SATURN 1.1 GHA	Dec.	MOON GHA	code	Dec.	code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
0	105 45.1	164 26.2	−21 39.7	145 11.6	−16 35.6	127 43.5	−10 21.4	282 41.5	+ 1 10.2	191 08.3	7	−28 17.9	+ 20
1	120 47.5	179 25.3	39.1	160 12.1	35.0	142 45.5	21.2	297 44.0	10.2	205 28.0	9	28 15.9	+ 23
2	135 50.0	194 24.5	38.6	175 12.6	34.4	157 47.5	21.1	312 46.4	10.2	219 47.9	8	28 13.6	+ 25
3	150 52.5	209 23.6	·· 38.0	190 13.1	·· 33.8	172 49.5	·· 20.9	327 48.8	·· 10.2	234 07.7	10	·28 11.1	+ 27
4	165 54.9	224 22.8	37.4	205 13.6	33.1	187 51.5	20.7	342 51.3	10.2	248 27.7	9	28 08.4	+ 29
5	180 57.4	239 21.9	36.8	220 14.1	32.5	202 53.5	20.5	357 53.7	10.2	262 47.6	10	28 05.5	+ 32
6	195 59.9	254 21.1	−21 36.2	235 14.6	−16 31.9	217 55.6	−10 20.3	12 56.1	+ 1 10.3	277 07.6	11	−28 02.3	+ 34
7	211 02.3	269 20.2	35.6	250 15.2	31.3	232 57.6	20.1	27 58.6	10.3	291 27.7	11	27 58.9	+ 35
8	226 04.8	284 19.4	34.9	265 15.7	30.6	247 59.6	20.0	43 01.0	10.3	305 47.8	12	27 55.4	+ 38
9	241 07.3	299 18.5	·· 34.3	280 16.2	·· 30.0	263 01.6	·· 19.8	58 03.5	·· 10.3	320 08.0	12	·27 51.6	+ 40
10	256 09.7	314 17.7	33.7	295 16.7	29.4	278 03.6	19.6	73 05.9	10.3	334 28.2	13	27 47.6	+ 42
11	271 12.2	329 16.8	33.1	310 17.2	28.8	293 05.6	19.4	88 08.3	10.3	348 48.5	14	27 43.4	+ 45
12	286 14.7	344 16.0	−21 32.5	325 17.7	−16 28.2	308 07.6	−10 19.2	103 10.8	+ 1 10.3	3 08.9	15	−27 38.9	+ 46
13	301 17.1	359 15.1	31.9	340 18.3	27.5	323 09.6	19.0	118 13.2	10.3	17 29.4	15	27 34.3	+ 49
14	316 19.6	14 14.3	31.3	355 18.8	26.9	338 11.6	18.8	133 15.7	10.3	31 49.9	17	27 29.4	+ 50
15	331 22.0	29 13.5	·· 30.7	10 19.3	·· 26.3	353 13.6	·· 18.7	148 18.1	·· 10.3	46 10.6	17	·27 24.4	+ 53
16	346 24.5	44 12.6	30.1	25 19.8	25.7	8 15.6	18.5	163 20.5	10.3	60 31.3	18	27 19.1	+ 55
17	1 27.0	59 11.8	29.5	40 20.3	25.0	23 17.6	18.3	178 23.0	10.3	74 52.1	18	27 13.6	+ 56
18	16 29.4	74 10.9	−21 28.9	55 20.8	−16 24.4	38 19.6	−10 18.1	193 25.4	+ 1 10.3	89 12.9	20	−27 08.0	+ 59
19	31 31.9	89 10.1	28.2	70 21.4	23.8	53 21.6	17.9	208 27.9	10.3	103 33.9	21	27 02.1	+ 61
20	46 34.4	104 09.2	27.6	85 21.9	23.1	68 23.6	17.7	223 30.3	10.3	117 55.0	21	26 56.0	+ 62
21	61 36.8	119 08.4	·· 27.0	100 22.4	·· 22.5	83 25.6	·· 17.5	238 32.8	·· 10.3	132 16.1	23	·26 49.8	+ 65
22	76 39.3	134 07.6	26.4	115 22.9	21.9	98 27.6	17.4	253 35.2	10.3	146 37.4	24	26 43.3	+ 67
23	91 41.8	149 06.7	25.8	130 23.4	21.3	113 29.6	17.2	268 37.6	10.3	160 58.8	24	26 36.6	+ 68
0	106 44.2	164 05.9	−21 25.1	145 24.0	−16 20.6	128 31.6	−10 17.0	283 40.1	+ 1 10.3	175 20.2	26	−26 29.8	+ 70
1	121 46.7	179 05.0	24.5	160 24.5	20.0	143 33.6	16.8	298 42.5	10.3	189 41.8	27	26 22.8	+ 73
2	136 49.2	194 04.2	23.9	175 25.0	19.4	158 35.6	16.6	313 45.0	10.3	204 03.5	28	26 15.5	+ 74
3	151 51.6	209 03.4	·· 23.3	190 25.5	·· 18.8	173 37.6	·· 16.4	328 47.4	·· 10.3	218 25.3	29	·26 08.1	+ 76
4	166 54.1	224 02.5	22.6	205 26.0	18.1	188 39.6	16.2	343 49.8	10.3	232 47.2	30	26 00.5	+ 78
5	181 56.5	239 01.7	22.0	220 26.6	17.5	203 41.6	16.1	358 52.3	10.3	247 09.2	32	25 52.7	+ 80
6	196 59.0	254 00.9	−21 21.4	235 27.1	−16 16.9	218 43.6	−10 15.9	13 54.7	+ 1 10.3	261 31.4	32	−25 44.7	+ 81
7	212 01.5	269 00.0	20.8	250 27.6	16.2	233 45.5	15.7	28 57.2	10.3	275 53.6	34	25 36.6	+ 83
8	227 03.9	283 59.2	20.1	265 28.1	15.6	248 47.5	15.5	43 59.6	10.3	290 16.0	35	25 28.3	+ 85
9	242 06.4	298 58.4	·· 19.5	280 28.6	·· 15.0	263 49.5	·· 15.3	59 02.1	·· 10.3	304 38.5	37	·25 19.8	+ 87
10	257 08.9	313 57.5	18.9	295 29.2	14.3	278 51.5	15.1	74 04.5	10.3	319 01.2	37	25 11.1	+ 89
11	272 11.3	328 56.7	18.2	310 29.7	13.7	293 53.5	14.9	89 07.0	10.3	333 23.9	39	25 02.2	+ 90
12	287 13.8	343 55.9	−21 17.6	325 30.2	−16 13.1	308 55.5	−10 14.7	104 09.4	+ 1 10.4	347 46.8	40	−24 53.2	+ 91
13	302 16.3	358 55.0	17.0	340 30.7	12.5	323 57.5	14.6	119 11.8	10.4	2 09.8	42	24 44.1	+ 94
14	317 18.7	13 54.2	16.3	355 31.3	11.8	338 59.5	14.4	134 14.3	10.4	16 33.0	43	24 34.7	+ 95
15	332 21.2	28 53.4	·· 15.7	10 31.8	·· 11.2	354 01.5	·· 14.2	149 16.7	·· 10.4	30 56.3	44	·24 25.2	+ 97
16	347 23.7	43 52.5	15.1	25 32.3	10.6	9 03.5	14.0	164 19.2	10.4	45 19.7	45	24 15.5	+ 98
17	2 26.1	58 51.7	14.4	40 32.8	09.9	24 05.5	13.8	179 21.6	10.4	59 43.2	47	24 05.7	+100
18	17 28.6	73 50.9	−21 13.8	55 33.3	−16 09.3	39 07.5	−10 13.6	194 24.1	+ 1 10.4	74 06.9	48	−23 55.7	+101
19	32 31.0	88 50.0	13.1	70 33.9	08.7	54 09.5	13.4	209 26.5	10.4	88 30.7	50	23 45.6	+103
20	47 33.5	103 49.2	12.5	85 34.4	08.0	69 11.5	13.3	224 29.0	10.4	102 54.7	51	23 35.3	+104
21	62 36.0	118 48.4	·· 11.8	100 34.9	·· 07.4	84 13.5	·· 13.1	239 31.4	·· 10.4	117 18.8	52	·23 24.9	+106
22	77 38.4	133 47.6	11.2	115 35.4	06.8	99 15.5	12.9	254 33.8	10.4	131 43.0	53	23 14.3	+107
23	92 40.9	148 46.7	10.6	130 36.0	06.1	114 17.5	12.7	269 36.3	10.4	146 07.3	55	23 03.6	+109
0	107 43.4	163 45.9	−21 09.9	145 36.5	−16 05.5	129 19.5	−10 12.5	284 38.7	+ 1 10.4	160 31.8	57	−22 52.7	+110
1	122 45.8	178 45.1	09.3	160 37.0	04.9	144 21.5	12.3	299 41.2	10.4	174 56.5	58	22 41.7	+111
2	137 48.3	193 44.2	08.6	175 37.5	04.2	159 23.5	12.1	314 43.6	10.4	189 21.3	59	22 30.6	+113
3	152 50.8	208 43.4	·· 08.0	190 38.1	·· 03.6	174 25.5	·· 11.9	329 46.1	·· 10.4	203 46.2	60	·22 19.3	+114
4	167 53.2	223 42.6	07.3	205 38.6	03.0	189 27.5	11.8	344 48.5	10.4	218 11.2	62	22 07.9	+115
5	182 55.7	238 41.8	06.6	220 39.1	02.3	204 29.5	11.6	359 51.0	10.4	232 36.4	64	21 56.4	+117
6	197 58.1	253 41.0	−21 06.0	235 39.6	−16 01.7	219 31.5	−10 11.4	14 53.4	+ 1 10.4	247 01.8	65	−21 44.7	+118
7	213 00.6	268 40.1	05.3	250 40.2	01.0	234 33.5	11.2	29 55.9	10.4	261 27.3	66	21 32.9	+119
8	228 03.1	283 39.3	04.7	265 40.7	16 00.4	249 35.5	11.0	44 58.3	10.5	275 52.9	68	21 21.0	+120
9	243 05.5	298 38.5	·· 04.0	280 41.2	·15 59.8	264 37.5	·· 10.8	60 00.8	·· 10.5	290 18.7	69	·21 09.0	+122
10	258 08.0	313 37.7	03.4	295 41.7	59.1	279 39.4	10.6	75 03.2	10.5	304 44.6	70	20 56.8	+122
11	273 10.5	328 36.8	02.7	310 42.3	58.5	294 41.4	10.4	90 05.7	10.5	319 10.6	72	20 44.6	+124
12	288 12.9	343 36.0	−21 02.0	325 42.8	−15 57.9	309 43.4	−10 10.2	105 08.1	+ 1 10.5	333 36.8	73	−20 32.2	+125
13	303 15.4	358 35.2	01.4	340 43.3	57.2	324 45.4	10.1	120 10.6	10.5	348 03.1	75	20 19.7	+126
14	318 17.9	13 34.4	00.7	355 43.8	56.6	339 47.4	09.9	135 13.0	10.5	2 29.6	76	20 07.1	+127
15	333 20.3	28 33.6	·21 00.1	10 44.4	·· 55.9	354 49.4	·· 09.7	150 15.5	·· 10.5	16 56.2	77	·19 54.4	+128
16	348 22.8	43 32.7	20 59.4	25 44.9	55.3	9 51.4	09.5	165 17.9	10.5	31 22.9	79	19 41.6	+129
17	3 25.3	58 31.9	58.7	40 45.4	54.7	24 53.4	09.3	180 20.4	10.5	45 49.8	80	19 28.7	+130
18	18 27.7	73 31.1	−20 58.1	55 45.9	−15 54.0	39 55.4	−10 09.1	195 22.8	+ 1 10.5	60 16.8	82	−19 15.7	+132
19	33 30.2	88 30.3	57.4	70 46.5	53.4	54 57.4	08.9	210 25.3	10.5	74 44.0	82	19 02.5	+132
20	48 32.6	103 29.5	56.7	85 47.0	52.7	69 59.4	08.7	225 27.7	10.5	89 11.2	85	18 49.3	+133
21	63 35.1	118 28.7	·· 56.1	100 47.5	·· 52.1	85 01.4	·· 08.5	240 30.2	·· 10.5	103 38.7	85	·18 36.0	+134
22	78 37.6	133 27.8	55.4	115 48.1	51.5	100 03.4	08.4	255 32.6	10.5	118 06.2	87	18 22.6	+135
23	93 40.0	148 27.0	54.7	130 48.6	50.8	115 05.4	08.2	270 35.1	10.6	132 33.9	88	18 09.1	+135
24	108 42.5	163 26.2	−20 54.0	145 49.1	−15 50.2	130 07.4	−10 08.0	285 37.5	+ 1 10.6	147 01.7	90	−17 55.6	+137
code	—	− 9	+ 6	+ 5	+ 6	+ 20	+ 1	+ 24	0				

GCT h	SUN GHA ° ′	Dec. ° ′
0	178 31.9	−22 30.3
1	193 31.6	30.0
2	208 31.4	29.7
3	223 31.1	·· 29.4
4	238 30.8	29.1
5	253 30.5	28.7
6	268 30.3	−22 28.4
7	283 30.0	28.1
8	298 29.7	27.8
9	313 29.4	·· 27.5
10	328 29.2	27.2
11	343 28.9	26.9
12	358 28.6	−22 26.6
13	13 28.3	26.3
14	28 28.1	26.0
15	43 27.8	·· 25.7
16	58 27.5	25.4
17	73 27.2	25.0
18	88 27.0	−22 24.7
19	103 26.7	24.4
20	118 26.4	24.1
21	133 26.2	·· 23.8
22	148 25.9	23.5
23	163 25.6	23.2
0	178 25.3	−22 22.8
1	193 25.1	22.5
2	208 24.8	22.2
3	223 24.5	·· 21.9
4	238 24.3	21.6
5	253 24.0	21.2
6	268 23.7	−22 20.9
7	283 23.5	20.6
8	298 23.2	20.3
9	313 22.9	·· 19.9
10	328 22.6	19.6
11	343 22.4	19.3
12	358 22.1	−22 19.0
13	13 21.8	18.6
14	28 21.6	18.3
15	43 21.3	·· 18.0
16	58 21.0	17.6
17	73 20.8	17.3
18	88 20.5	−22 17.0
19	103 20.2	16.6
20	118 20.0	16.3
21	133 19.7	·· 16.0
22	148 19.4	15.6
23	163 19.2	15.3
0	178 18.9	−22 15.0
1	193 18.6	14.6
2	208 18.4	14.3
3	223 18.1	·· 14.0
4	238 17.8	13.6
5	253 17.6	13.3
6	268 17.3	−22 12.9
7	283 17.1	12.6
8	298 16.8	12.2
9	313 16.5	·· 11.9
10	328 16.3	11.6
11	343 16.0	11.2
12	358 15.7	−22 10.9
13	13 15.5	10.5
14	28 15.2	10.2
15	43 15.0	·· 09.8
16	58 14.7	09.5
17	73 14.4	09.1
18	88 14.2	−22 08.8
19	103 13.9	08.4
20	118 13.6	08.1
21	133 13.4	·· 07.7
22	148 13.1	07.4
23	163 12.9	07.0
24	178 12.6	−22 06.7
code	—	+ 4

STARS No.	SHA ° ′	Dec. ° ′	Transit Mer. Gr. h m
1	358 32.4	+28 49.4	16 56
2	358 22.1	+58 53.1	16 57
3	349 43.0	−18 15.4	17 31
4	339 21.2	+59 59.2	18 13
5	336 01.3	−57 29.3	18 26
6	332 40.8	+89 02.4	18 39
7	328 53.8	+23 14.1	18 54
8	315 53.6	−40 30.1	19 46
9	309 47.5	+49 41.6	20 11
10	291 43.1	+16 24.9	21 23
11	281 56.9	− 8 15.3	22 02
12	281 43.5	+45 57.3	22 03
13	279 22.1	+ 6 18.5	22 12
14	279 11.7	+28 34.3	22 13
15	276 33.7	− 1 13.8	22 23
16	271 51.8	+ 7 24.1	22 42
17	264 16.5	−52 40.0	23 12
18	259 14.8	−16 38.8	23 32
19	255 49.1	−28 54.2	23 46
20	245 48.5	+ 5 21.2	0 30
21	244 24.7	+28 08.8	0 35
22	234 36.8	−59 20.9	1 14
23	223 26.8	−43 13.9	1 59
24	221 49.4	−69 30.7	2 05
25	218 42.0	− 8 26.7	2 18
26	208 33.2	+12 12.4	2 58
27	194 48.5	+62 00.7	3 53
28	183 21.4	+14 50.6	4 39
29	174 02.2	−62 49.4	5 16
30	172 53.5	−56 50.1	5 21
31	168 47.5	−59 25.1	5 37
32	167 01.5	+56 13.2	5 44
33	159 30.5	+55 10.5	6 14
34	159 20.9	−10 54.4	6 15
35	153 35.7	+49 33.1	6 38
36	149 03.3	−36 07.7	6 56
37	146 38.6	+19 26.0	7 05
38	140 56.6	−60 38.0	7 28
39	137 17.8	+74 20.9	7 43
40	126 51.0	+26 52.4	8 24
41	120 38.7	−22 29.1	8 49
42	113 24.3	−26 19.6	9 18
43	109 08.9	−68 56.4	9 35
44	103 06.8	−15 40.1	9 59
45	97 26.2	−37 04.3	10 22
46	96 50.4	+12 35.4	10 24
47	91 08.5	+51 29.4	10 47
48	84 46.5	−34 24.7	11 12
49	81 11.2	+38 44.0	11 26
50	76 56.9	−26 21.7	11 43
51	62 54.4	+ 8 44.1	12 39
52	54 33.6	−56 53.9	13 13
53	50 04.1	+45 06.2	13 31
54	34 33.6	+ 9 38.9	14 32
55	28 42.8	−47 12.2	14 56
56	16 15.9	−29 53.1	15 45
57	14 25.4	+14 56.5	15 53

Lat. N °	Sunrise h m	Twlt. begins h m	Moonrise 7 h m	8 h m	9 h m	10 h m
70	■	6 42	■	■	■	11 51
68	11 13	6 36	■	■	12 21	11 28
66	10 14	6 30	■	■	11 38	11 09
64	9 41	6 26	■	11 43	11 09	10 54
62	9 17	6 21	11 22	10 56	10 47	10 41
60	8 58	6 17	10 10	10 25	10 29	10 30
58	8 42	6 13	9 34	10 01	10 14	10 20
56	8 28	6 09	9 08	9 42	10 01	10 12
54	8 17	6 06	8 48	9 26	9 49	10 04
52	8 06	6 03	8 30	9 12	9 39	9 58
50	7 57	6 00	8 16	9 00	9 30	9 51
45	7 38	5 52	7 46	8 35	9 11	9 38
40	7 22	5 45	7 22	8 15	8 55	9 27
35	7 09	5 39	7 03	7 58	8 42	9 18
30	6 57	5 32	6 46	7 43	8 30	9 09
20	6 37	5 19	6 18	7 18	8 10	8 55
10	6 19	5 04	5 54	6 57	7 53	8 42
0	6 03	4 47	5 31	6 36	7 36	8 30
10	5 46	4 29	5 08	6 16	7 20	8 18
20	5 28	4 04	4 44	5 54	7 02	8 06
30	5 07	3 31	4 16	5 29	6 41	7 51
35	4 55	3 09	3 59	5 14	6 29	7 42
40	4 41	2 40	3 40	4 56	6 15	7 32
45	4 24	1 56	3 16	4 35	5 59	7 21
50	4 03	////	2 46	4 09	5 38	7 07
52	3 52	////	2 31	3 56	5 28	7 00
54	3 41	////	2 13	3 41	5 17	6 52
56	3 28	////	1 52	3 23	5 05	6 44
58	3 13	////	1 25	3 02	4 50	6 35
60	2 54	////	0 47	2 35	4 33	6 24
S						

Lat. N °	Sunset h m	Twlt. ends h m	Moonset 7 h m	8 h m	9 h m	10 h m
70	■	17 32	■	■	■	17 59
68	13 00	17 39	■	■	15 39	18 21
66	13 59	17 44	■	■	16 20	18 38
64	14 32	17 48	■	14 12	16 48	18 52
62	14 57	17 53	12 18	14 59	17 09	19 04
60	15 16	17 57	13 30	15 29	17 26	19 13
58	15 32	18 01	14 05	15 51	17 40	19 22
56	15 45	18 04	14 30	16 10	17 52	19 29
54	15 57	18 08	14 51	16 25	18 03	19 36
52	16 07	18 11	15 08	16 39	18 12	19 41
50	16 16	18 14	15 22	16 50	18 21	19 47
45	16 35	18 21	15 52	17 14	18 38	19 58
40	16 51	18 28	16 15	17 34	18 52	20 07
35	17 05	18 35	16 34	17 50	19 05	20 15
30	17 16	18 41	16 50	18 04	19 15	20 22
20	17 36	18 54	17 17	18 27	19 33	20 34
10	17 54	19 09	17 41	18 47	19 48	20 45
0	18 10	19 24	18 03	19 05	20 03	20 54
10	18 27	19 44	18 24	19 24	20 17	21 04
20	18 45	20 08	18 47	19 44	20 32	21 14
30	19 05	20 40	19 14	20 06	20 49	21 25
35	19 18	21 03	19 30	20 19	20 59	21 32
40	19 32	21 31	19 48	20 34	21 10	21 39
45	19 49	22 14	20 10	20 52	21 24	21 48
50	20 10	////	20 37	21 14	21 39	21 58
52	20 20	////	20 50	21 24	21 47	22 03
54	20 31	////	21 06	21 36	21 55	22 08
56	20 44	////	21 24	21 49	22 04	22 14
58	20 59	////	21 46	22 05	22 15	22 20
60	21 17	////	22 13	22 23	22 27	22 27
S						

GCT h	Equation of Time (App.—Mean) 7 m s	8 m s	9 m s
0	− 5 51.8	− 6 18.1	− 6 43.8
6	− 5 58.5	− 6 24.6	− 6 50.2
12	− 6 05.0	− 6 31.0	− 6 56.5
18	− 6 11.6	− 6 37.5	− 7 02.8
24	− 6 18.1	− 6 43.8	− 7 09.1

GCT of Transit Meridian of Greenwich

DAY	Moon h m	Venus h m	Mars h m	Jupiter h m	Saturn h m
7	11 47	13 03	14 19	15 27	5 08
8	12 51	13 04	14 18	15 24	5 05
9	13 50	13 06	14 17	15 21	5 01
10	14 42	13 07	14 16	15 18	4 57

ADDITIONAL ALTITUDE CORRECTIONS

Alt. °	Sun's Low'r Limb ′	Venus ′	Mars ′
0			
	0.6	0.1	0.1
30			
	0.6	0.1	0.1
45			
	0.6	0.1	0.0
60			
	0.6	0.0	0.0
75			
	0.6	0.0	0.0
90			

Moon's Lower Limb
Add

Alt. °	7 ′	8 ′	9 ′
0			
	20.4	19.9	19.0
4			
	20.4	19.9	19.0
8			
	20.3	19.8	18.9
12			
	20.3	19.8	18.9
16			
	20.2	19.7	18.9
20			
	20.1	19.6	18.8
24			
	20.0	19.5	18.7
28			
	19.9	19.4	18.6
32			
	19.7	19.3	18.5
36			
	19.6	19.2	18.4
40			
	19.4	19.0	18.3
44			
	19.2	18.8	18.2
48			
	19.0	18.7	18.0
52			
	18.8	18.5	17.9
56			
	18.6	18.3	17.7
60			
	18.4	18.1	17.6
64			
	18.1	17.9	17.4
68			
	17.9	17.6	17.2
72			
	17.6	17.4	17.0
76			
	17.4	17.2	16.8
80			
	17.1	17.0	16.7
84			
	16.9	16.7	16.5
88			
	16.7	16.5	16.3
90			

Add to table, back cover

Moon's Upper Limb
Subtract

Alt. °	7 ′	8 ′	9 ′
0			
	12.8	13.1	13.6
4			
	12.8	13.1	13.6
8			
	12.8	13.1	13.6
12			
	12.9	13.2	13.7
16			
	13.0	13.2	13.7
20			
	13.1	13.3	13.8
24			
	13.2	13.4	13.9
28			
	13.3	13.5	13.9
32			
	13.4	13.7	14.0
36			
	13.6	13.8	14.2
40			
	13.8	13.9	14.3
44			
	13.9	14.1	14.4
48			
	14.1	14.3	14.5
52			
	14.3	14.5	14.7
56			
	14.6	14.7	14.9
60			
	14.8	14.9	15.0
64			
	15.0	15.1	15.2
68			
	15.3	15.3	15.4
72			
	15.5	15.5	15.5
76			
	15.8	15.8	15.7
80			
	16.1	16.0	15.9
84			
	16.3	16.2	16.1
88			
	16.5	16.4	16.2
90			

Subtract from table, back cover

New Moon 7

G C T	♈ GHA	VENUS −3.4 GHA	Dec.	MARS 1.4 GHA	Dec.	JUPITER −1.7 GHA	Dec.	SATURN 1.1 GHA	Dec.	MOON GHA	code	Dec.	code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
0	108 42.5	163 26.2	−20 54.0	145 49.1	−15 50.2	130 07.4	−10 08.0	285 37.5	+ 1 10.6	147 01.7	90	−17 55.6	+137
1	123 45.0	178 25.4	53.4	160 49.6	49.5	145 09.3	07.8	300 40.0	10.6	161 29.7	91	17 41.9	+137
2	138 47.4	193 24.6	52.7	175 50.2	48.9	160 11.3	07.6	315 42.4	10.6	175 57.8	92	17 28.2	+138
3	153 49.9	208 23.8	·· 52.0	190 50.7	·· 48.3	175 13.3	·· 07.4	330 44.9	·· 10.6	190 26.0	94	·17 14.4	+139
4	168 52.4	223 23.0	51.3	205 51.2	47.6	190 15.3	07.2	345 47.3	10.6	204 54.4	94	17 00.5	+140
5	183 54.8	238 22.1	50.7	220 51.8	47.0	205 17.3	07.0	0 49.8	10.6	219 22.8	96	16 46.5	+140
6	198 57.3	253 21.3	−20 50.0	235 52.3	−15 46.3	220 19.3	−10 06.8	15 52.2	+ 1 10.6	233 51.4	98	−16 32.5	+142
7	213 59.8	268 20.5	49.3	250 52.8	45.7	235 21.3	06.7	30 54.7	10.6	248 20.2	98	16 18.3	+142
8	229 02.2	283 19.7	48.6	265 53.4	45.0	250 23.3	06.5	45 57.1	10.6	262 49.0	100	16 04.1	+142
9	244 04.7	298 18.9	·· 47.9	280 53.9	·· 44.4	265 25.3	·· 06.3	60 59.6	·· 10.6	277 18.0	101	·15 49.9	+143
10	259 07.1	313 18.1	47.2	295 54.4	43.8	280 27.3	06.1	76 02.0	10.6	291 47.1	103	15 35.6	+144
11	274 09.6	328 17.3	46.6	310 54.9	43.1	295 29.3	05.9	91 04.5	10.6	306 16.4	103	15 21.2	+145
12	289 12.1	343 16.5	−20 45.9	325 55.5	−15 42.5	310 31.3	−10 05.7	106 06.9	+ 1 10.7	320 45.7	105	−15 06.7	+145
13	304 14.5	358 15.7	45.2	340 56.0	41.8	325 33.2	05.5	121 09.4	10.7	335 15.2	106	14 52.2	+146
14	319 17.0	13 14.9	44.5	355 56.5	41.2	340 35.2	05.3	136 11.8	10.7	349 44.8	107	14 37.6	+146
15	334 19.5	28 14.1	·· 43.8	10 57.1	·· 40.5	355 37.2	·· 05.1	151 14.3	·· 10.7	4 14.5	108	·14 23.0	+147
16	349 21.9	43 13.3	43.1	25 57.6	39.9	10 39.2	04.9	166 16.7	10.7	18 44.3	110	14 08.3	+147
17	4 24.4	58 12.4	42.4	40 58.1	39.2	25 41.2	04.8	181 19.2	10.7	33 14.3	110	13 53.6	+148
18	19 26.9	73 11.6	−20 41.7	55 58.7	−15 38.6	40 43.2	−10 04.6	196 21.7	+ 1 10.7	47 44.3	112	−13 38.8	+149
19	34 29.3	88 10.8	41.0	70 59.2	37.9	55 45.2	04.4	211 24.1	10.7	62 14.5	113	13 23.9	+148
20	49 31.8	103 10.0	40.4	85 59.7	37.3	70 47.2	04.2	226 26.6	10.7	76 44.8	114	13 09.1	+150
21	64 34.3	118 09.2	·· 39.7	101 00.3	·· 36.7	85 49.2	·· 04.0	241 29.0	·· 10.7	91 15.2	114	·12 54.1	+149
22	79 36.7	133 08.4	39.0	116 00.8	36.0	100 51.2	03.8	256 31.5	10.7	105 45.6	117	12 39.2	+151
23	94 39.2	148 07.6	38.3	131 01.3	35.4	115 53.1	03.6	271 33.9	10.7	120 16.3	117	12 24.1	+150
0	109 41.6	163 06.8	−20 37.6	146 01.9	−15 34.7	130 55.1	−10 03.4	286 36.4	+ 1 10.8	134 47.0	118	−12 09.1	+151
1	124 44.1	178 06.0	36.9	161 02.4	34.1	145 57.1	03.2	301 38.8	10.8	149 17.8	119	11 54.0	+152
2	139 46.6	193 05.2	36.2	176 02.9	33.4	160 59.1	03.0	316 41.3	10.8	163 48.7	120	11 38.8	+151
3	154 49.0	208 04.4	·· 35.5	191 03.5	·· 32.8	176 01.1	·· 02.8	331 43.7	·· 10.8	178 19.7	122	·11 23.7	+152
4	169 51.5	223 03.6	34.8	206 04.0	32.1	191 03.1	02.7	346 46.2	10.8	192 50.9	122	11 08.5	+153
5	184 54.0	238 02.8	34.1	221 04.5	31.5	206 05.1	02.5	1 48.7	10.8	207 22.1	123	10 53.2	+152
6	199 56.4	253 02.0	−20 33.3	236 05.1	−15 30.8	221 07.1	−10 02.3	16 51.1	+ 1 10.8	221 53.4	124	−10 38.0	+153
7	214 58.9	268 01.2	32.6	251 05.6	30.2	236 09.0	02.1	31 53.6	10.8	236 24.8	125	10 22.7	+154
8	230 01.4	283 00.4	31.9	266 06.1	29.5	251 11.0	01.9	46 56.0	10.8	250 56.3	126	10 07.3	+153
9	245 03.8	297 59.6	·· 31.2	281 06.7	·· 28.9	266 13.0	·· 01.7	61 58.5	·· 10.8	265 27.9	127	· 9 52.0	+154
10	260 06.3	312 58.8	30.5	296 07.2	28.2	281 15.0	01.5	77 00.9	10.8	279 59.6	128	9 36.6	+154
11	275 08.8	327 58.0	29.8	311 07.7	27.6	296 17.0	01.3	92 03.4	10.9	294 31.4	129	9 21.2	+154
12	290 11.2	342 57.2	−20 29.1	326 08.3	−15 26.9	311 19.0	−10 01.1	107 05.8	+ 1 10.9	309 03.3	130	− 9 05.8	+155
13	305 13.7	357 56.4	28.4	341 08.8	26.3	326 21.0	00.9	122 08.3	10.9	323 35.3	130	8 50.3	+154
14	320 16.1	12 55.7	27.7	356 09.3	25.6	341 23.0	00.7	137 10.8	10.9	338 07.3	132	8 34.9	+155
15	335 18.6	27 54.9	·· 27.0	11 09.9	·· 25.0	356 25.0	·· 00.6	152 13.2	·· 10.9	352 39.5	132	· 8 19.4	+155
16	350 21.1	42 54.1	26.2	26 10.4	24.3	11 26.9	00.4	167 15.7	10.9	7 11.7	133	8 03.9	+155
17	5 23.5	57 53.3	25.5	41 11.0	23.7	26 28.9	00.2	182 18.1	10.9	21 44.0	134	7 48.4	+155
18	20 26.0	72 52.5	−20 24.8	56 11.5	−15 23.0	41 30.9	−10 00.0	197 20.6	+ 1 10.9	36 16.4	134	− 7 32.9	+156
19	35 28.5	87 51.7	24.1	71 12.0	22.3	56 32.9	9 59.8	212 23.1	10.9	50 48.8	136	7 17.3	+155
20	50 30.9	102 50.9	23.4	86 12.6	21.7	71 34.9	59.6	227 25.5	11.0	65 21.4	136	7 01.8	+156
21	65 33.4	117 50.1	·· 22.6	101 13.1	·· 21.0	86 36.9	·· 59.4	242 28.0	·· 11.0	79 54.0	137	· 6 46.2	+155
22	80 35.9	132 49.3	21.9	116 13.6	20.4	101 38.9	59.2	257 30.4	11.0	94 26.7	138	6 30.7	+156
23	95 38.3	147 48.5	21.2	131 14.2	19.7	116 40.8	59.0	272 32.9	11.0	108 59.5	138	6 15.1	+156
0	110 40.8	162 47.7	−20 20.5	146 14.7	−15 19.1	131 42.8	− 9 58.8	287 35.3	+ 1 11.0	123 32.3	139	− 5 59.5	+156
1	125 43.2	177 47.0	19.8	161 15.3	18.4	146 44.8	58.6	302 37.8	11.0	138 05.2	140	5 43.9	+156
2	140 45.7	192 46.2	19.0	176 15.8	17.8	161 46.8	58.4	317 40.3	11.0	152 38.2	140	5 28.3	+155
3	155 48.2	207 45.4	·· 18.3	191 16.3	·· 17.1	176 48.8	·· 58.3	332 42.7	·· 11.0	167 11.2	142	· 5 12.8	+156
4	170 50.6	222 44.6	17.6	206 16.9	16.5	191 50.8	58.1	347 45.2	11.0	181 44.4	141	4 57.2	+156
5	185 53.1	237 43.8	16.8	221 17.4	15.8	206 52.8	57.9	2 47.6	11.0	196 17.5	143	4 41.6	+156
6	200 55.6	252 43.0	−20 16.1	236 17.9	−15 15.1	221 54.7	− 9 57.7	17 50.1	+ 1 11.1	210 50.8	143	− 4 26.0	+156
7	215 58.0	267 42.2	15.4	251 18.5	14.5	236 56.7	57.5	32 52.6	11.1	225 24.1	143	4 10.4	+156
8	231 00.5	282 41.4	14.7	266 19.0	13.8	251 58.7	57.3	47 55.0	11.1	239 57.4	145	3 54.8	+155
9	246 03.0	297 40.7	·· 13.9	281 19.6	·· 13.2	267 00.7	·· 57.1	62 57.5	·· 11.1	254 30.9	144	· 3 39.3	+156
10	261 05.4	312 39.9	13.2	296 20.1	12.5	282 02.7	56.9	77 59.9	11.1	269 04.3	146	3 23.7	+156
11	276 07.9	327 39.1	12.5	311 20.6	11.9	297 04.7	56.7	93 02.4	11.1	283 37.9	146	3 08.1	+155
12	291 10.4	342 38.3	−20 11.7	326 21.2	−15 11.2	312 06.7	− 9 56.5	108 04.9	+ 1 11.1	298 11.5	146	− 2 52.6	+156
13	306 12.8	357 37.5	11.0	341 21.7	10.6	327 08.6	56.3	123 07.3	11.1	312 45.1	147	2 37.0	+155
14	321 15.3	12 36.8	10.2	356 22.3	09.9	342 10.6	56.1	138 09.8	11.2	327 18.8	148	2 21.5	+155
15	336 17.7	27 36.0	·· 09.5	11 22.8	·· 09.2	357 12.6	·· 55.9	153 12.3	·· 11.2	341 52.6	148	· 2 06.0	+155
16	351 20.2	42 35.2	08.8	26 23.3	08.6	12 14.6	55.7	168 14.7	11.2	356 26.4	148	1 50.5	+155
17	6 22.7	57 34.4	08.0	41 23.9	07.9	27 16.6	55.6	183 17.2	11.2	11 00.2	149	1 35.0	+155
18	21 25.1	72 33.6	−20 07.3	56 24.4	−15 07.3	42 18.6	− 9 55.4	198 19.6	+ 1 11.2	25 34.1	149	− 1 19.5	+155
19	36 27.6	87 32.9	06.5	71 25.0	06.6	57 20.5	55.2	213 22.1	11.2	40 08.0	150	1 04.0	+154
20	51 30.1	102 32.1	05.8	86 25.5	05.9	72 22.5	55.0	228 24.6	11.2	54 42.0	150	0 48.6	+154
21	66 32.5	117 31.3	·· 05.0	101 26.1	·· 05.3	87 24.5	·· 54.8	243 27.0	·· 11.2	69 16.0	151	· 0 33.2	+154
22	81 35.0	132 30.5	04.3	116 26.6	04.6	102 26.5	54.6	258 29.5	11.3	83 50.1	151	0 17.8	+154
23	96 37.5	147 29.7	03.6	131 27.1	04.0	117 28.5	54.4	273 32.0	11.3	98 24.2	151	− 0 02.4	+154
24	111 39.9	162 29.0	−20 02.8	146 27.7	−15 03.3	132 30.5	− 9 54.2	288 34.4	+ 1 11.3	112 58.3	152	+ 0 13.0	+154
code	—	− 8	+ 7	+ 5	+ 6	+ 20	+ 2	+ 25	0				

GCT	SUN GHA	SUN Dec.
h	° ′	° ′
0	178 12.6	−22 06.7
1	193 12.3	06.3
2	208 12.1	05.9
3	223 11.8 ••	05.6
4	238 11.6	05.2
5	253 11.3	04.9
6	268 11.0	−22 04.5
7	283 10.8	04.2
8	298 10.5	03.8
9	313 10.3 ••	03.4
10	328 10.0	03.1
11	343 09.8	02.7
12	358 09.5	−22 02.3
13	13 09.2	02.0
14	28 09.0	01.6
15	43 08.7 ••	01.2
16	58 08.5	00.9
17	73 08.2	00.5
18	88 08.0	−22 00.1
19	103 07.7	21 59.8
20	118 07.5	59.4
21	133 07.2 ••	59.0
22	148 06.9	58.7
23	163 06.7	58.3
0	178 06.4	−21 57.9
1	193 06.2	57.5
2	208 05.9	57.2
3	223 05.7 ••	56.8
4	238 05.4	56.4
5	253 05.2	56.0
6	268 04.9	−21 55.7
7	283 04.7	55.3
8	298 04.4	54.9
9	313 04.2 ••	54.5
10	328 03.9	54.2
11	343 03.7	53.8
12	358 03.4	−21 53.4
13	13 03.2	53.0
14	28 02.9	52.6
15	43 02.7 ••	52.2
16	58 02.4	51.9
17	73 02.2	51.5
18	88 01.9	−21 51.1
19	103 01.7	50.7
20	118 01.4	50.3
21	133 01.2 ••	49.9
22	148 00.9	49.5
23	163 00.7	49.1
0	178 00.4	−21 48.8
1	193 00.2	48.4
2	207 59.9	48.0
3	222 59.7 ••	47.6
4	237 59.4	47.2
5	252 59.2	46.8
6	267 58.9	−21 46.4
7	282 58.7	46.0
8	297 58.4	45.6
9	312 58.2 ••	45.2
10	327 58.0	44.8
11	342 57.7	44.4
12	357 57.5	−21 44.0
13	12 57.2	43.6
14	27 57.0	43.2
15	42 56.7 ••	42.8
16	57 56.5	42.4
17	72 56.3	42.0
18	87 56.0	−21 41.6
19	102 55.8	41.2
20	117 55.5	40.8
21	132 55.3 ••	40.4
22	147 55.0	40.0
23	162 54.8	39.6
24	177 54.6	−21 39.2
code	—	+ 4

No.	STARS SHA	Dec.	Transit Mer. Gr.
	° ′	° ′	h m
1	358 32.4	+28 49.3	16 44
2	358 22.1	+58 53.1	16 45
3	349 43.0	−18 15.4	17 20
4	339 21.3	+59 59.2	18 01
5	336 01.3	−57 29.3	18 14
6	332 41.7	+89 02.5	18 27
7	328 53.8	+23 14.1	18 43
8	315 53.6	−40 30.1	19 34
9	309 47.6	+49 41.6	19 59
10	291 43.1	+16 24.9	21 11
11	281 56.9	− 8 15.3	21 50
12	281 43.5	+45 57.3	21 51
13	279 22.1	+ 6 18.5	22 00
14	279 11.7	+28 34.3	22 01
15	276 33.7	− 1 13.8	22 11
16	271 51.8	+ 7 24.1	22 30
17	264 16.5	−52 40.0	23 00
18	259 14.8	−16 38.8	23 20
19	255 49.1	−28 54.2	23 34
20	245 48.5	+ 5 21.2	0 18
21	244 24.7	+28 08.8	0 24
22	234 36.8	−59 20.9	1 03
23	223 26.8	−43 13.9	1 47
24	221 49.3	−69 30.7	1 54
25	218 42.0	− 8 26.7	2 06
26	208 33.2	+12 12.4	2 47
27	194 48.4	+62 00.7	3 41
28	183 21.3	+14 50.6	4 27
29	174 02.1	−62 49.4	5 04
30	172 53.5	−56 50.1	5 09
31	168 47.4	−59 25.1	5 25
32	167 01.5	+56 13.2	5 32
33	159 30.4	+55 10.5	6 02
34	159 20.8	−10 54.4	6 03
35	153 35.7	+49 33.1	6 26
36	149 03.2	−36 07.7	6 44
37	146 38.6	+19 25.9	6 54
38	140 56.5	−60 38.0	7 16
39	137 17.8	+74 20.9	7 31
40	126 50.9	+26 52.4	8 12
41	120 38.7	−22 29.1	8 37
42	113 24.2	−26 19.6	9 06
43	109 08.9	−68 56.4	9 23
44	103 06.8	−15 40.1	9 47
45	97 26.1	−37 04.3	10 10
46	96 50.4	+12 35.4	10 12
47	91 08.5	+51 29.4	10 35
48	84 46.5	−34 24.7	11 00
49	81 11.2	+38 44.0	11 15
50	76 56.9	−26 21.7	11 32
51	62 54.4	+ 8 44.1	12 28
52	54 33.6	−56 53.8	13 01
53	50 04.1	+45 06.2	13 19
54	34 33.6	+ 9 38.9	14 21
55	28 42.8	−47 12.2	14 44
56	16 15.9	−29 53.1	15 34
57	14 25.4	+14 56.5	15 41

GCT	Equation of Time (App.—Mean) 10	11	12
h	m s	m s	m s
0	− 7 09.1	− 7 33.7	− 7 57.8
6	− 7 15.3	− 7 39.8	− 8 03.8
12	− 7 21.5	− 7 45.9	− 8 09.6
18	− 7 27.6	− 7 51.9	− 8 15.5
24	− 7 33.7	− 7 57.8	− 8 21.3

Lat.	Sunrise	Twlt. begins	Moonrise 10	11	12	13
N °	h m	h m	h m	h m	h m	h m
70	■	6 38	11 51	11 11	10 42	10 16
68	10 56	6 33	11 28	11 00	10 38	10 19
66	10 06	6 28	11 09	10 50	10 35	10 21
64	9 36	6 24	10 54	10 42	10 33	10 24
62	9 13	6 19	10 41	10 35	10 30	10 25
60	8 54	6 15	10 30	10 29	10 28	10 27
58	8 39	6 12	10 20	10 24	10 27	10 29
56	8 26	6 08	10 12	10 19	10 25	10 30
54	8 15	6 05	10 04	10 15	10 24	10 31
52	8 05	6 02	9 58	10 11	10 22	10 32
50	7 56	5 59	9 51	10 08	10 21	10 33
45	7 37	5 52	9 38	10 00	10 18	10 35
40	7 22	5 46	9 27	9 53	10 16	10 37
35	7 09	5 39	9 18	9 48	10 14	10 39
30	6 57	5 32	9 09	9 43	10 12	10 40
20	6 38	5 19	8 55	9 34	10 09	10 43
10	6 20	5 05	8 42	9 27	10 07	10 45
0	6 04	4 50	8 30	9 19	10 04	10 47
10	5 48	4 30	8 18	9 12	10 02	10 49
20	5 30	4 06	8 06	9 04	9 59	10 52
30	5 10	3 34	7 51	8 56	9 56	10 54
35	4 58	3 13	7 42	8 51	9 55	10 56
40	4 44	2 44	7 32	8 45	9 53	10 58
45	4 27	2 03	7 21	8 38	9 50	11 00
50	4 07	0 16	7 07	8 30	9 48	11 02
52	3 57	////	7 00	8 26	9 46	11 03
54	3 46	////	6 52	8 22	9 45	11 05
56	3 33	////	6 44	8 17	9 44	11 06
58	3 18	////	6 35	8 12	9 42	11 08
60	3 01	////	6 24	8 06	9 40	11 09
S						

Lat.	Sunset	Twlt. ends	Moonset 10	11	12	13
N °	h m	h m	h m	h m	h m	h m
70	■	17 38	17 59	20 19	22 22	24 19
68	13 20	17 44	18 21	20 28	22 22	24 11
66	14 10	17 50	18 38	20 35	22 22	24 05
64	14 40	17 53	18 52	20 42	22 23	24 00
62	15 03	17 57	19 04	20 47	22 23	23 55
60	15 22	18 02	19 13	20 51	22 23	23 51
58	15 37	18 05	19 22	20 55	22 23	23 48
56	15 50	18 08	19 29	20 59	22 23	23 45
54	16 01	18 11	19 36	21 02	22 23	23 42
52	16 11	18 14	19 41	21 05	22 24	23 39
50	16 20	18 17	19 47	21 07	22 24	23 37
45	16 39	18 24	19 58	21 13	22 24	23 32
40	16 54	18 30	20 07	21 18	22 24	23 28
35	17 07	18 37	20 15	21 22	22 24	23 25
30	17 19	18 43	20 22	21 25	22 24	23 21
20	17 38	18 56	20 34	21 31	22 25	23 16
10	17 55	19 10	20 45	21 36	22 25	23 11
0	18 12	19 26	20 54	21 41	22 25	23 07
10	18 28	19 45	21 04	21 46	22 25	23 03
20	18 45	20 08	21 14	21 51	22 25	22 58
30	19 05	20 39	21 25	21 57	22 25	22 53
35	19 17	21 01	21 32	22 00	22 25	22 50
40	19 31	21 29	21 39	22 04	22 25	22 46
45	19 48	22 10	21 48	22 08	22 26	22 42
50	20 08	23 43	21 58	22 13	22 26	22 38
52	20 18	////	22 03	22 15	22 26	22 36
54	20 29	////	22 08	22 18	22 26	22 33
56	20 41	////	22 14	22 20	22 26	22 31
58	20 56	////	22 20	22 23	22 26	22 28
60	21 13	////	22 27	22 27	22 26	22 25
S						

GCT of Transit Meridian of Greenwich

DAY	Moon	Venus	Mars	Jupiter	Saturn
	h m	h m	h m	h m	h m
10	14 42	13 07	14 16	15 18	4 57
11	15 30	13 08	14 15	15 14	4 53
12	16 15	13 10	14 15	15 11	4 49
13	16 57	13 11	14 14	15 08	4 45

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb	Venus	Mars
°	′	′	′
0			
	0.6	0.1	0.1
30			
	0.6	0.1	0.1
45			
	0.6	0.1	0.0
60			
	0.6	0.0	0.0
75			
	0.6	0.0	0.0
90			

Moon's Lower Limb
Add

Alt.	10	11	12
°	′	′	′
0			
	18.0	16.7	15.6
4			
	18.0	16.7	15.6
8			
	17.9	16.7	15.6
12			
	17.9	16.7	15.6
16			
	17.9	16.7	15.6
20			
	17.8	16.6	15.6
24			
	17.8	16.6	15.6
28			
	17.7	16.6	15.6
32			
	17.6	16.5	15.6
36			
	17.6	16.5	15.6
40			
	17.5	16.5	15.6
44			
	17.4	16.4	15.6
48			
	17.3	16.4	15.6
52			
	17.2	16.3	15.6
56			
	17.1	16.3	15.6
60			
	17.0	16.2	15.6
64			
	16.8	16.2	15.6
68			
	16.7	16.1	15.6
72			
	16.6	16.0	15.6
76			
	16.5	16.0	15.6
80			
	16.3	15.9	15.6
84			
	16.2	15.9	15.6
88			
	16.1	15.8	15.6
90			

Add to table, back cover

Moon's Upper Limb
Subtract

Alt.	10	11	12
°	′	′	′
0			
	14.2	14.9	15.6
4			
	14.2	14.9	15.6
8			
	14.2	14.9	15.6
12			
	14.2	14.9	15.6
16			
	14.3	14.9	15.6
20			
	14.3	15.0	15.6
24			
	14.4	15.0	15.6
28			
	14.4	15.0	15.6
32			
	14.5	15.0	15.6
36			
	14.6	15.1	15.6
40			
	14.7	15.1	15.6
44			
	14.7	15.2	15.6
48			
	14.8	15.2	15.6
52			
	15.0	15.3	15.6
56			
	15.1	15.3	15.6
60			
	15.2	15.4	15.6
64			
	15.3	15.4	15.6
68			
	15.4	15.5	15.6
72			
	15.5	15.5	15.6
76			
	15.7	15.6	15.6
80			
	15.8	15.7	15.6
84			
	15.9	15.7	15.6
88			
	16.0	15.8	15.6
90			

Subtract from table, back cover

G.C.T.	♈ GHA	VENUS −3.3 GHA	Dec.	MARS 1.4 GHA	Dec.	JUPITER −1.7 GHA	Dec.	SATURN 1.0 GHA	Dec.	MOON GHA	code	Dec.	code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
0	111 39.9	162 29.0	−20 02.8	146 27.7	−15 03.3	132 30.5	− 9 54.2	288 34.4	+ 1 11.3	112 58.3	152	+ 0 13.0	+154
1	126 42.4	177 28.2	02.1	161 28.2	02.6	147 32.4	54.0	303 36.9	11.3	127 32.5	152	0 28.4	+153
2	141 44.9	192 27.4	01.3	176 28.8	02.0	162 34.4	53.8	318 39.3	11.3	142 06.7	153	0 43.7	+153
3	156 47.3	207 26.6	·20 00.6	191 29.3	·· 01.3	177 36.4	·· 53.6	333 41.8	·· 11.3	156 41.0	153	· 0 59.0	+153
4	171 49.8	222 25.9	19 59.8	206 29.9	00.7	192 38.4	53.4	348 44.3	11.3	171 15.3	153	1 14.3	+152
5	186 52.2	237 25.1	59.1	221 30.4	15 00.0	207 40.4	53.2	3 46.7	11.3	185 49.6	153	1 29.5	+153
6	201 54.7	252 24.3	−19 58.3	236 30.9	−14 59.3	222 42.4	− 9 53.0	18 49.2	+ 1 11.4	200 23.9	154	+ 1 44.8	+152
7	216 57.2	267 23.6	57.5	251 31.5	58.7	237 44.3	52.8	33 51.7	11.4	214 58.3	154	2 00.0	+152
8	231 59.6	282 22.8	56.8	266 32.0	58.0	252 46.3	52.6	48 54.1	11.4	229 32.7	154	2 15.2	+151
9	247 02.1	297 22.0	·· 56.0	281 32.6	·· 57.3	267 48.3	·· 52.5	63 56.6	·· 11.4	244 07.1	155	· 2 30.3	+151
10	262 04.6	312 21.2	55.3	296 33.1	56.7	282 50.3	52.3	78 59.1	11.4	258 41.6	154	2 45.4	+151
11	277 07.0	327 20.5	54.5	311 33.7	56.0	297 52.3	52.1	94 01.5	11.4	273 16.0	155	3 00.5	+151
12	292 09.5	342 19.7	−19 53.7	326 34.2	−14 55.4	312 54.2	− 9 51.9	109 04.0	+ 1 11.4	287 50.5	155	+ 3 15.6	+150
13	307 12.0	357 18.9	53.0	341 34.8	54.7	327 56.2	51.7	124 06.5	11.4	302 25.0	156	3 30.6	+150
14	322 14.4	12 18.2	52.2	356 35.3	54.0	342 58.2	51.5	139 08.9	11.5	316 59.6	155	3 45.6	+150
15	337 16.9	27 17.4	·· 51.5	11 35.8	·· 53.4	358 00.2	·· 51.3	154 11.4	·· 11.5	331 34.1	156	· 4 00.6	+149
16	352 19.4	42 16.6	50.7	26 36.4	52.7	13 02.2	51.1	169 13.9	11.5	346 08.7	156	4 15.5	+149
17	7 21.8	57 15.9	49.9	41 36.9	52.0	28 04.1	50.9	184 16.3	11.5	0 43.3	156	4 30.4	+149
18	22 24.3	72 15.1	−19 49.2	56 37.5	−14 51.4	43 06.1	− 9 50.7	199 18.8	+ 1 11.5	15 17.9	156	+ 4 45.3	+148
19	37 26.7	87 14.3	48.4	71 38.0	50.7	58 08.1	50.5	214 21.3	11.5	29 52.5	156	5 00.1	+148
20	52 29.2	102 13.6	47.6	86 38.6	50.0	73 10.1	50.3	229 23.7	11.5	44 27.1	156	5 14.9	+147
21	67 31.7	117 12.8	·· 46.9	101 39.1	·· 49.4	88 12.1	·· 50.1	244 26.2	·· 11.6	59 01.7	157	· 5 29.6	+147
22	82 34.1	132 12.0	46.1	116 39.7	48.7	103 14.0	49.9	259 28.7	11.6	73 36.4	156	5 44.3	+147
23	97 36.6	147 11.3	45.3	131 40.2	48.0	118 16.0	49.7	274 31.1	11.6	88 11.0	157	5 59.0	+146
0	112 39.1	162 10.5	−19 44.5	146 40.8	−14 47.4	133 18.0	− 9 49.5	289 33.6	+ 1 11.6	102 45.7	157	+ 6 13.6	+146
1	127 41.5	177 09.8	43.8	161 41.3	46.7	148 20.0	49.3	304 36.1	11.6	117 20.4	156	6 28.2	+146
2	142 44.0	192 09.0	43.0	176 41.9	46.0	163 22.0	49.1	319 38.5	11.6	131 55.0	157	6 42.8	+145
3	157 46.5	207 08.2	·· 42.2	191 42.4	·· 45.4	178 23.9	·· 48.9	334 41.0	·· 11.6	146 29.7	157	· 6 57.3	+144
4	172 48.9	222 07.5	41.4	206 43.0	44.7	193 25.9	48.8	349 43.5	11.7	161 04.4	157	7 11.7	+145
5	187 51.4	237 06.7	40.7	221 43.5	44.0	208 27.9	48.6	4 45.9	11.7	175 39.1	156	7 26.2	+143
6	202 53.8	252 05.9	−19 39.9	236 44.0	−14 43.4	223 29.9	− 9 48.4	19 48.4	+ 1 11.7	190 13.7	157	+ 7 40.5	+144
7	217 56.3	267 05.2	39.1	251 44.6	42.7	238 31.9	48.2	34 50.9	11.7	204 48.4	157	7 54.9	+142
8	232 58.8	282 04.4	38.3	266 45.1	42.0	253 33.8	48.0	49 53.3	11.7	219 23.1	157	8 09.1	+143
9	248 01.2	297 03.7	·· 37.6	281 45.7	·· 41.4	268 35.8	·· 47.8	64 55.8	·· 11.7	233 57.8	156	· 8 23.4	+142
10	263 03.7	312 02.9	36.8	296 46.2	40.7	283 37.8	47.6	79 58.3	11.7	248 32.4	157	8 37.6	+141
11	278 06.2	327 02.2	36.0	311 46.8	40.0	298 39.8	47.4	95 00.7	11.8	263 07.1	156	8 51.7	+141
12	293 08.6	342 01.4	−19 35.2	326 47.3	−14 39.4	313 41.8	− 9 47.2	110 03.2	+ 1 11.8	277 41.7	157	+ 9 05.8	+141
13	308 11.1	357 00.6	34.4	341 47.9	38.7	328 43.7	47.0	125 05.7	11.8	292 16.4	156	9 19.9	+139
14	323 13.6	11 59.9	33.6	356 48.4	38.0	343 45.7	46.8	140 08.1	11.8	306 51.0	156	9 33.8	+140
15	338 16.0	26 59.1	·· 32.8	11 49.0	·· 37.3	358 47.7	·· 46.6	155 10.6	·· 11.8	321 25.6	157	· 9 47.8	+139
16	353 18.5	41 58.4	32.1	26 49.5	36.7	13 49.7	46.4	170 13.1	11.8	336 00.3	156	10 01.7	+138
17	8 21.0	56 57.6	31.3	41 50.1	36.0	28 51.6	46.2	185 15.6	11.9	350 34.9	155	10 15.5	+138
18	23 23.4	71 56.9	−19 30.5	56 50.6	−14 35.3	43 53.6	− 9 46.0	200 18.0	+ 1 11.9	5 09.4	156	+10 29.3	+137
19	38 25.9	86 56.1	29.7	71 51.2	34.7	58 55.6	45.8	215 20.5	11.9	19 44.0	156	10 43.0	+137
20	53 28.3	101 55.4	28.9	86 51.7	34.0	73 57.6	45.6	230 23.0	11.9	34 18.6	155	10 56.7	+136
21	68 30.8	116 54.6	·· 28.1	101 52.3	·· 33.3	88 59.6	·· 45.4	245 25.4	·· 11.9	48 53.1	155	·11 10.3	+136
22	83 33.3	131 53.9	27.3	116 52.8	32.6	104 01.5	45.2	260 27.9	11.9	63 27.6	155	11 23.9	+135
23	98 35.7	146 53.1	26.5	131 53.4	32.0	119 03.5	45.0	275 30.4	11.9	78 02.1	155	11 37.4	+135
0	113 38.2	161 52.4	−19 25.7	146 54.0	−14 31.3	134 05.5	− 9 44.8	290 32.9	+ 1 12.0	92 36.6	155	+11 50.9	+134
1	128 40.7	176 51.6	24.9	161 54.5	30.6	149 07.5	44.6	305 35.3	12.0	107 11.1	154	12 04.3	+133
2	143 43.1	191 50.9	24.1	176 55.1	30.0	164 09.4	44.4	320 37.8	12.0	121 45.5	154	12 17.6	+133
3	158 45.6	206 50.1	·· 23.3	191 55.6	·· 29.3	179 11.4	·· 44.2	335 40.3	·· 12.0	136 19.9	154	·12 30.9	+132
4	173 48.1	221 49.4	22.5	206 56.2	28.6	194 13.4	44.1	350 42.7	12.0	150 54.3	154	12 44.1	+132
5	188 50.5	236 48.6	21.7	221 56.7	27.9	209 15.4	43.9	5 45.2	12.0	165 28.7	153	12 57.3	+131
6	203 53.0	251 47.9	−19 20.9	236 57.3	−14 27.3	224 17.3	− 9 43.7	20 47.7	+ 1 12.1	180 03.0	153	+13 10.4	+130
7	218 55.5	266 47.1	20.1	251 57.8	26.6	239 19.3	43.5	35 50.2	12.1	194 37.3	153	13 23.4	+130
8	233 57.9	281 46.4	19.3	266 58.4	25.9	254 21.3	43.3	50 52.6	12.1	209 11.6	153	13 36.4	+129
9	249 00.4	296 45.7	·· 18.5	281 58.9	·· 25.2	269 23.3	·· 43.1	65 55.1	·· 12.1	223 45.9	152	·13 49.3	+129
10	264 02.8	311 44.9	17.7	296 59.5	24.6	284 25.2	42.9	80 57.6	12.1	238 20.1	152	14 02.2	+127
11	279 05.3	326 44.2	16.9	312 00.0	23.9	299 27.2	42.7	96 00.1	12.1	252 54.3	152	14 14.9	+128
12	294 07.8	341 43.4	−19 16.1	327 00.6	−14 23.2	314 29.2	− 9 42.5	111 02.5	+ 1 12.2	267 28.5	151	+14 27.7	+126
13	309 10.2	356 42.7	15.3	342 01.1	22.5	329 31.2	42.3	126 05.0	12.2	282 02.6	151	14 40.3	+126
14	324 12.7	11 41.9	14.5	357 01.7	21.9	344 33.2	42.1	141 07.5	12.2	296 36.7	151	14 52.9	+125
15	339 15.2	26 41.2	·· 13.7	12 02.2	·· 21.2	359 35.1	·· 41.9	156 09.9	·· 12.2	311 10.8	150	·15 05.4	+125
16	354 17.6	41 40.5	12.9	27 02.8	20.5	14 37.1	41.7	171 12.4	12.2	325 44.8	150	15 17.9	+123
17	9 20.1	56 39.7	12.0	42 03.4	19.8	29 39.1	41.5	186 14.9	12.3	340 18.8	149	15 30.2	+124
18	24 22.6	71 39.0	−19 11.2	57 03.9	−14 19.1	44 41.1	− 9 41.3	201 17.4	+ 1 12.3	354 52.7	149	+15 42.6	+122
19	39 25.0	86 38.3	10.4	72 04.5	18.5	59 43.0	41.1	216 19.8	12.3	9 26.6	149	15 54.8	+122
20	54 27.5	101 37.5	09.6	87 05.0	17.8	74 45.0	40.9	231 22.3	12.3	24 00.5	149	16 07.0	+121
21	69 29.9	116 36.8	·· 08.8	102 05.6	·· 17.1	89 47.0	·· 40.7	246 24.8	·· 12.3	38 34.4	147	·16 19.1	+120
22	84 32.4	131 36.0	08.0	117 06.1	16.4	104 48.9	40.5	261 27.3	12.3	53 08.1	148	16 31.1	+120
23	99 34.9	146 35.3	07.2	132 06.7	15.8	119 50.9	40.3	276 29.7	12.4	67 41.9	147	16 43.1	+118
24	114 37.3	161 34.6	−19 06.3	147 07.3	−14 15.1	134 52.9	− 9 40.1	291 32.2	+ 1 12.4	82 15.6	147	+16 54.9	+118
code	–	− 8	+ 8	+ 6	+ 7	+ 19	+ 2	+ 25	0				

GCT h	SUN GHA ° ′	SUN Dec. ° ′
0	177 54.6	−21 39.2
1	192 54.3	38.7
2	207 54.1	38.3
3	222 53.8	•• 37.9
4	237 53.6	37.5
5	252 53.4	37.1
6	267 53.1	−21 36.7
7	282 52.9	36.3
8	297 52.6	35.9
9	312 52.4	•• 35.5
10	327 52.2	35.0
11	342 51.9	34.6
12	357 51.7	−21 34.2
13	12 51.4	33.8
14	27 51.2	33.4
15	42 51.0	•• 32.9
16	57 50.7	32.5
17	72 50.5	32.1
18	87 50.3	−21 31.7
19	102 50.0	31.3
20	117 49.8	30.8
21	132 49.6	•• 30.4
22	147 49.3	30.0
23	162 49.1	29.6
0	177 48.8	−21 29.1
1	192 48.6	28.7
2	207 48.4	28.3
3	222 48.1	•• 27.9
4	237 47.9	27.4
5	252 47.7	27.0
6	267 47.4	−21 26.6
7	282 47.2	26.1
8	297 47.0	25.7
9	312 46.7	•• 25.3
10	327 46.5	24.9
11	342 46.3	24.4
12	357 46.1	−21 24.0
13	12 45.8	23.6
14	27 45.6	23.1
15	42 45.4	•• 22.7
16	57 45.1	22.2
17	72 44.9	21.8
18	87 44.7	−21 21.4
19	102 44.4	20.9
20	117 44.2	20.5
21	132 44.0	•• 20.0
22	147 43.8	19.6
23	162 43.5	19.2
0	177 43.3	−21 18.7
1	192 43.1	18.3
2	207 42.8	17.8
3	222 42.6	•• 17.4
4	237 42.4	16.9
5	252 42.2	16.5
6	267 41.9	−21 16.1
7	282 41.7	15.6
8	297 41.5	15.2
9	312 41.3	•• 14.7
10	327 41.0	14.3
11	342 40.8	13.8
12	357 40.6	−21 13.4
13	12 40.4	12.9
14	27 40.1	12.5
15	42 39.9	•• 12.0
16	57 39.7	11.5
17	72 39.5	11.1
18	87 39.3	−21 10.6
19	102 39.0	10.2
20	117 38.8	09.7
21	132 38.6	•• 09.3
22	147 38.4	08.8
23	162 38.1	08.3
24	177 37.9	−21 07.9
code	–	+ 4

STARS No.	SHA ° ′	Dec. ° ′	Transit Mer. Gr. h m
1	358 32.4	+28 49.3	16 33
2	358 22.2	+58 53.1	16 33
3	349 43.0	−18 15.4	17 08
4	339 21.3	+59 59.2	17 49
5	336 01.3	−57 29.3	18 02
6	332 42.7	+89 02.5	18 16
7	328 53.8	+23 14.1	18 31
8	315 53.7	−40 30.1	19 23
9	309 47.6	+49 41.6	19 47
10	291 43.1	+16 24.9	20 59
11	281 56.9	− 8 15.3	21 38
12	281 43.5	+45 57.3	21 39
13	279 22.1	+ 6 18.5	21 48
14	279 11.7	+28 34.3	21 49
15	276 33.7	− 1 13.8	22 00
16	271 51.8	+ 7 24.1	22 18
17	264 16.5	−52 40.1	22 49
18	259 14.8	−16 38.8	23 09
19	255 49.1	−28 54.2	23 22
20	245 48.5	+ 5 21.2	0 06
21	244 24.7	+28 08.8	0 12
22	234 36.8	−59 20.9	0 51
23	223 26.8	−43 13.9	1 35
24	221 49.3	−69 30.7	1 42
25	218 42.0	− 8 26.7	1 54
26	208 33.2	+12 12.4	2 35
27	194 48.4	+62 00.7	3 30
28	183 21.3	+14 50.6	4 15
29	174 02.1	−62 49.5	4 52
30	172 53.5	−56 50.1	4 57
31	168 47.4	−59 25.1	5 13
32	167 01.4	+56 13.2	5 20
33	159 30.4	+55 10.5	5 50
34	159 20.8	−10 54.4	5 51
35	153 35.7	+49 33.1	6 14
36	149 03.2	−36 07.7	6 32
37	146 38.6	+19 25.9	6 42
38	140 56.5	−60 38.0	7 04
39	137 17.7	+74 20.9	7 19
40	126 50.9	+26 52.4	8 01
41	120 38.7	−22 29.1	8 25
42	113 24.2	−26 19.6	8 54
43	109 08.8	−68 56.4	9 11
44	103 06.7	−15 40.1	9 35
45	97 26.1	−37 04.3	9 58
46	96 50.4	+12 35.4	10 00
47	91 08.5	+51 29.4	10 23
48	84 46.5	−34 24.7	10 49
49	81 11.2	+38 44.0	11 03
50	76 56.8	−26 21.7	11 20
51	62 54.4	+ 8 44.1	12 16
52	54 33.6	−56 53.8	12 49
53	50 04.1	+45 06.2	13 07
54	34 33.6	+ 9 38.9	14 09
55	28 42.8	−47 12.2	14 32
56	16 15.9	−29 53.1	15 22
57	14 25.4	+14 56.5	15 29

GCT h	Equation of Time (App.—Mean) 13 m s	14 m s	15 m s
0	− 8 21.3	− 8 44.2	− 9 06.3
6	− 8 27.1	− 8 49.8	− 9 11.8
12	− 8 32.8	− 8 55.3	− 9 17.2
18	− 8 38.5	− 9 00.9	− 9 22.5
24	− 8 44.2	− 9 06.3	− 9 27.9

Lat. N °	Sunrise h m	Twlt. begins h m	Moonrise 13 h m	14 h m	15 h m	16 h m
70	■	6 34	10 16	9 49	9 16	8 21
68	10 41	6 29	10 19	9 59	9 36	9 02
66	9 58	6 25	10 21	10 07	9 51	9 31
64	9 29	6 21	10 24	10 14	10 04	9 53
62	9 08	6 16	10 25	10 20	10 15	10 10
60	8 50	6 13	10 27	10 26	10 25	10 25
58	8 36	6 10	10 29	10 31	10 33	10 37
56	8 23	6 06	10 30	10 35	10 41	10 48
54	8 12	6 03	10 31	10 39	10 47	10 58
52	8 03	6 00	10 32	10 42	10 53	11 07
50	7 54	5 58	10 33	10 45	10 59	11 14
45	7 36	5 51	10 35	10 52	11 10	11 31
40	7 21	5 45	10 37	10 58	11 20	11 45
35	7 08	5 39	10 39	11 03	11 28	11 56
30	6 57	5 33	10 40	11 08	11 36	12 06
20	6 38	5 20	10 43	11 15	11 49	12 24
10	6 21	5 07	10 45	11 22	12 00	12 40
0	6 05	4 51	10 47	11 29	12 11	12 54
10	5 49	4 33	10 49	11 35	12 22	13 09
20	5 32	4 09	10 52	11 42	12 33	13 25
30	5 12	3 37	10 54	11 51	12 47	13 43
35	5 00	3 16	10 56	11 55	12 54	13 54
40	4 47	2 49	10 58	12 01	13 03	14 06
45	4 31	2 09	11 00	12 07	13 14	14 21
50	4 11	0 46	11 02	12 15	13 26	14 39
52	4 01	////	11 03	12 18	13 32	14 47
54	3 50	////	11 05	12 22	13 39	14 57
56	3 38	////	11 06	12 26	13 46	15 07
58	3 24	////	11 08	12 31	13 55	15 20
60	3 07	////	11 09	12 37	14 04	15 34
S						

Lat. N °	Sunset h m	Twlt. ends h m	Moonset 13 h m	14 h m	15 h m	16 h m
70	■	17 45	24 19	0 19	2 20	4 46
68	13 37	17 50	24 11	0 11	2 02	4 05
66	14 20	17 54	24 05	0 05	1 48	3 38
64	14 49	17 59	24 00	0 00	1 37	3 17
62	15 11	18 03	23 55	25 27	1 27	3 01
60	15 28	18 06	23 51	25 18	1 18	2 47
58	15 43	18 10	23 48	25 11	1 11	2 35
56	15 55	18 12	23 45	25 05	1 05	2 25
54	16 06	18 15	23 42	24 59	0 59	2 16
52	16 16	18 18	23 39	24 54	0 54	2 08
50	16 24	18 20	23 37	24 49	0 49	2 01
45	16 43	18 28	23 32	24 39	0 39	1 46
40	16 57	18 33	23 28	24 31	0 31	1 33
35	17 10	18 39	23 25	24 24	0 24	1 23
30	17 21	18 45	23 21	24 18	0 18	1 14
20	17 40	18 58	23 16	24 07	0 07	0 58
10	17 57	19 11	23 11	23 58	24 44	0 44
0	18 13	19 27	23 07	23 49	24 32	0 32
10	18 28	19 44	23 03	23 40	24 19	0 19
20	18 45	20 07	22 58	23 31	24 05	0 05
30	19 05	20 39	22 53	23 20	23 50	24 22
35	19 17	21 00	22 50	23 14	23 41	24 10
40	19 30	21 27	22 46	23 08	23 31	23 57
45	19 46	22 06	22 42	23 00	23 19	23 41
50	20 06	23 24	22 38	22 50	23 05	23 22
52	20 16	////	22 36	22 46	22 58	23 13
54	20 26	////	22 33	22 41	22 51	23 03
56	20 39	////	22 31	22 36	22 43	22 52
58	20 52	////	22 28	22 30	22 33	22 39
60	21 09	////	22 25	22 23	22 23	22 23
S						

GCT of Transit Meridian of Greenwich

DAY	Moon h m	Venus h m	Mars h m	Jupiter h m	Saturn h m
13	16 57	13 11	14 14	15 08	4 45
14	17 39	13 12	14 13	15 05	4 41
15	18 21	13 13	14 12	15 02	4 37
16	19 05	13 14	14 11	14 59	4 33

ADDITIONAL ALTITUDE CORRECTIONS

Alt. °	Sun's Low'r Limb ′	Venus ′	Mars ′
0 – 30	0.6	0.1	0.1
30 – 45	0.6	0.1	0.1
45 – 60	0.6	0.1	0.0
60 – 75	0.6	0.0	0.0
75 – 90	0.6	0.0	0.0

Moon's Lower Limb
Add

Alt. °	13 ′	14 ′	15 ′
0 – 4	14.4	13.5	12.8
4 – 8	14.4	13.5	12.8
8 – 12	14.4	13.5	12.8
12 – 16	14.4	13.6	12.8
16 – 20	14.4	13.6	12.9
20 – 24	14.5	13.6	12.9
24 – 28	14.5	13.7	13.0
28 – 32	14.5	13.7	13.0
32 – 36	14.6	13.8	13.1
36 – 40	14.6	13.9	13.2
40 – 44	14.6	13.9	13.3
44 – 48	14.7	14.0	13.4
48 – 52	14.7	14.1	13.5
52 – 56	14.8	14.2	13.7
56 – 60	14.8	14.3	13.8
60 – 64	14.9	14.4	13.9
64 – 68	14.9	14.5	14.1
68 – 72	15.0	14.6	14.2
72 – 76	15.1	14.7	14.3
76 – 80	15.1	14.8	14.5
80 – 84	15.2	14.9	14.6
84 – 88	15.2	15.0	14.8
88 – 90	15.3	15.1	14.9

Add to table, back cover

Moon's Upper Limb
Subtract

Alt. °	13 ′	14 ′	15 ′
0 – 4	16.2	16.7	17.2
4 – 8	16.2	16.7	17.1
8 – 12	16.2	16.7	17.1
12 – 16	16.2	16.7	17.1
16 – 20	16.2	16.6	17.0
20 – 24	16.1	16.6	17.0
24 – 28	16.1	16.6	16.9
28 – 32	16.1	16.5	16.9
32 – 36	16.1	16.4	16.8
36 – 40	16.0	16.4	16.7
40 – 44	16.0	16.3	16.6
44 – 48	15.9	16.2	16.5
48 – 52	15.9	16.1	16.4
52 – 56	15.8	16.1	16.2
56 – 60	15.8	16.0	16.1
60 – 64	15.7	15.9	16.0
64 – 68	15.7	15.8	15.8
68 – 72	15.6	15.7	15.7
72 – 76	15.6	15.6	15.6
76 – 80	15.5	15.4	15.4
80 – 84	15.4	15.3	15.3
84 – 88	15.4	15.2	15.1
88 – 90	15.3	15.1	15.0

Subtract from table, back cover

First Quarter 15

G C T	♈ GHA	VENUS −3.3 GHA	Dec.	MARS 1.4 GHA	Dec.	JUPITER −1.7 GHA	Dec.	SATURN 1.0 GHA	Dec.	MOON GHA	code	Dec.	code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
0	114 37.3	161 34.6	−19 06.3	147 07.3	−14 15.1	134 52.9	− 9 40.1	291 32.2	+ 1 12.4	82 15.6	147	+16 54.9	+118
1	129 39.8	176 33.8	05.5	162 07.8	14.4	149 54.9	39.9	306 34.7	12.4	96 49.3	146	17 06.7	+118
2	144 42.3	191 33.1	04.7	177 08.4	13.7	164 56.8	39.7	321 37.2	12.4	111 22.9	146	17 18.5	+116
3	159 44.7	206 32.4	·· 03.9	192 08.9	·· 13.0	179 58.8	·· 39.5	336 39.6	·· 12.4	125 56.5	145	·17 30.1	+116
4	174 47.2	221 31.6	03.1	207 09.5	12.4	195 00.8	39.3	351 42.1	12.4	140 30.0	145	17 41.7	+115
5	189 49.7	236 30.9	02.2	222 10.0	11.7	210 02.8	39.1	6 44.6	12.5	155 03.5	144	17 53.2	+114
6	204 52.1	251 30.2	−19 01.4	237 10.6	−14 11.0	225 04.7	− 9 38.9	21 47.1	+ 1 12.5	169 36.9	144	+18 04.6	+114
7	219 54.6	266 29.4	19 00.6	252 11.2	10.3	240 06.7	38.7	36 49.6	12.5	184 10.3	144	18 16.0	+113
8	234 57.1	281 28.7	18 59.8	267 11.7	09.6	255 08.7	38.5	51 52.0	12.5	198 43.7	143	18 27.3	+111
9	249 59.5	296 28.0	·· 58.9	282 12.3	·· 09.0	270 10.7	·· 38.3	66 54.5	·· 12.5	213 17.0	142	·18 38.4	+111
10	265 02.0	311 27.2	58.1	297 12.8	08.3	285 12.6	38.1	81 57.0	12.6	227 50.2	142	18 49.5	+111
11	280 04.4	326 26.5	57.3	312 13.4	07.6	300 14.6	37.9	96 59.5	12.6	242 23.4	142	19 00.6	+109
12	295 06.9	341 25.8	−18 56.4	327 13.9	−14 06.9	315 16.6	− 9 37.7	112 01.9	+ 1 12.6	256 56.6	141	+19 11.5	+109
13	310 09.4	356 25.1	55.6	342 14.5	06.2	330 18.6	37.5	127 04.4	12.6	271 29.7	140	19 22.4	+108
14	325 11.8	11 24.3	54.8	357 15.1	05.6	345 20.5	37.3	142 06.9	12.6	286 02.7	140	19 33.2	+107
15	340 14.3	26 23.6	·· 53.9	12 15.6	·· 04.9	0 22.5	·· 37.1	157 09.4	·· 12.6	300 35.7	140	·19 43.9	+106
16	355 16.8	41 22.9	53.1	27 16.2	04.2	15 24.5	36.9	172 11.9	12.7	315 08.7	138	19 54.5	+105
17	10 19.2	56 22.2	52.3	42 16.7	03.5	30 26.4	36.7	187 14.3	12.7	329 41.5	139	20 05.0	+104
18	25 21.7	71 21.4	−18 51.4	57 17.3	−14 02.8	45 28.4	− 9 36.5	202 16.8	+ 1 12.7	344 14.4	137	+20 15.4	+104
19	40 24.2	86 20.7	50.6	72 17.9	02.1	60 30.4	36.3	217 19.3	12.7	358 47.1	138	20 25.8	+102
20	55 26.6	101 20.0	49.8	87 18.4	01.5	75 32.4	36.1	232 21.8	12.7	13 19.9	136	20 36.0	+102
21	70 29.1	116 19.3	·· 48.9	102 19.0	·· 00.8	90 34.3	·· 35.9	247 24.3	·· 12.8	27 52.5	136	·20 46.2	+101
22	85 31.6	131 18.5	48.1	117 19.5	14 00.1	105 36.3	35.7	262 26.7	12.8	42 25.1	136	20 56.3	+100
23	100 34.0	146 17.8	47.2	132 20.1	13 59.4	120 38.3	35.5	277 29.2	12.8	56 57.7	135	21 06.3	+ 99
0	115 36.5	161 17.1	−18 46.4	147 20.7	−13 58.7	135 40.2	− 9 35.3	292 31.7	+ 1 12.8	71 30.2	134	+21 16.2	+ 98
1	130 38.9	176 16.4	45.6	162 21.2	58.0	150 42.2	35.1	307 34.2	12.8	86 02.6	134	21 26.0	+ 97
2	145 41.4	191 15.6	44.7	177 21.8	57.4	165 44.2	34.9	322 36.7	12.9	100 35.0	133	21 35.7	+ 96
3	160 43.9	206 14.9	·· 43.9	192 22.3	·· 56.7	180 46.2	·· 34.7	337 39.1	·· 12.9	115 07.3	133	·21 45.3	+ 96
4	175 46.3	221 14.2	43.0	207 22.9	56.0	195 48.1	34.5	352 41.6	12.9	129 39.6	132	21 54.9	+ 94
5	190 48.8	236 13.5	42.2	222 23.5	55.3	210 50.1	34.3	7 44.1	12.9	144 11.8	131	22 04.3	+ 93
6	205 51.3	251 12.8	−18 41.3	237 24.0	−13 54.6	225 52.1	− 9 34.1	22 46.6	+ 1 12.9	158 43.9	131	+22 13.6	+ 93
7	220 53.7	266 12.0	40.5	252 24.6	53.9	240 54.0	33.9	37 49.1	13.0	173 16.0	130	22 22.9	+ 91
8	235 56.2	281 11.3	39.6	267 25.2	53.2	255 56.0	33.7	52 51.5	13.0	187 48.0	130	22 32.0	+ 91
9	250 58.7	296 10.6	·· 38.8	282 25.7	·· 52.6	270 58.0	·· 33.5	67 54.0	·· 13.0	202 20.0	129	·22 41.1	+ 89
10	266 01.1	311 09.9	37.9	297 26.3	51.9	285 59.9	33.3	82 56.5	13.0	216 51.9	128	22 50.0	+ 89
11	281 03.6	326 09.2	37.1	312 26.8	51.2	301 01.9	33.1	97 59.0	13.0	231 23.7	128	22 58.9	+ 87
12	296 06.1	341 08.5	−18 36.2	327 27.4	−13 50.5	316 03.9	− 9 32.9	113 01.5	+ 1 13.1	245 55.5	127	+23 07.6	+ 87
13	311 08.5	356 07.8	35.4	342 28.0	49.8	331 05.9	32.7	128 03.9	13.1	260 27.2	127	23 16.3	+ 85
14	326 11.0	11 07.0	34.5	357 28.5	49.1	346 07.8	32.5	143 06.4	13.1	274 58.9	126	23 24.8	+ 85
15	341 13.4	26 06.3	·· 33.7	12 29.1	·· 48.4	1 09.8	·· 32.3	158 08.9	·· 13.1	289 30.5	125	·23 33.3	+ 83
16	356 15.9	41 05.6	32.8	27 29.7	47.7	16 11.8	32.1	173 11.4	13.1	304 02.0	125	23 41.6	+ 82
17	11 18.4	56 04.9	32.0	42 30.2	47.1	31 13.7	31.9	188 13.9	13.2	318 33.5	124	23 49.8	+ 82
18	26 20.8	71 04.2	−18 31.1	57 30.8	−13 46.4	46 15.7	− 9 31.7	203 16.4	+ 1 13.2	333 04.9	124	+23 58.0	+ 80
19	41 23.3	86 03.5	30.2	72 31.4	45.7	61 17.7	31.5	218 18.8	13.2	347 36.3	123	24 06.0	+ 79
20	56 25.8	101 02.8	29.4	87 31.9	45.0	76 19.6	31.3	233 21.3	13.2	2 07.6	122	24 13.9	+ 78
21	71 28.2	116 02.1	·· 28.5	102 32.5	·· 44.3	91 21.6	·· 31.1	248 23.8	·· 13.3	16 38.8	122	·24 21.7	+ 77
22	86 30.7	131 01.4	27.7	117 33.1	43.6	106 23.6	30.9	263 26.3	13.3	31 10.0	121	24 29.4	+ 76
23	101 33.2	146 00.6	26.8	132 33.6	42.9	121 25.5	30.7	278 28.8	13.3	45 41.1	120	24 37.0	+ 75
0	116 35.6	160 59.9	−18 25.9	147 34.2	−13 42.2	136 27.5	− 9 30.5	293 31.3	+ 1 13.3	60 12.1	120	+24 44.5	+ 74
1	131 38.1	175 59.2	25.1	162 34.8	41.5	151 29.5	30.3	308 33.7	13.3	74 43.1	119	24 51.9	+ 73
2	146 40.5	190 58.5	24.2	177 35.3	40.9	166 31.5	30.1	323 36.2	13.4	89 14.0	119	24 59.2	+ 71
3	161 43.0	205 57.8	·· 23.3	192 35.9	·· 40.2	181 33.4	·· 29.9	338 38.7	·· 13.4	103 44.9	118	·25 06.3	+ 71
4	176 45.5	220 57.1	22.5	207 36.4	39.5	196 35.4	29.7	353 41.2	13.4	118 15.7	117	25 13.4	+ 69
5	191 47.9	235 56.4	21.6	222 37.0	38.8	211 37.4	29.5	8 43.7	13.4	132 46.4	117	25 20.3	+ 68
6	206 50.4	250 55.7	−18 20.7	237 37.6	−13 38.1	226 39.3	− 9 29.3	23 46.2	+ 1 13.4	147 17.1	116	+25 27.1	+ 67
7	221 52.9	265 55.0	19.9	252 38.1	37.4	241 41.3	29.1	38 48.7	13.5	161 47.7	116	25 33.8	+ 66
8	236 55.3	280 54.3	19.0	267 38.7	36.7	256 43.3	28.9	53 51.1	13.5	176 18.3	115	25 40.4	+ 65
9	251 57.8	295 53.6	·· 18.1	282 39.3	·· 36.0	271 45.2	·· 28.7	68 53.6	·· 13.5	190 48.8	115	·25 46.9	+ 64
10	267 00.3	310 52.9	17.3	297 39.9	35.3	286 47.2	28.5	83 56.1	13.5	205 19.3	113	25 53.3	+ 62
11	282 02.7	325 52.2	16.4	312 40.4	34.6	301 49.2	28.3	98 58.6	13.6	219 49.6	114	25 59.5	+ 61
12	297 05.2	340 51.5	−18 15.5	327 41.0	−13 33.9	316 51.1	− 9 28.1	114 01.1	+ 1 13.6	234 20.0	112	+26 05.6	+ 60
13	312 07.7	355 50.8	14.6	342 41.6	33.2	331 53.1	27.9	129 03.6	13.6	248 50.2	112	26 11.6	+ 59
14	327 10.1	10 50.1	13.8	357 42.1	32.6	346 55.1	27.7	144 06.1	13.6	263 20.4	112	26 17.5	+ 58
15	342 12.6	25 49.4	·· 12.9	12 42.7	·· 31.9	1 57.0	·· 27.5	159 08.5	·· 13.6	277 50.6	111	·26 23.3	+ 56
16	357 15.0	40 48.7	12.0	27 43.3	31.2	16 59.0	27.3	174 11.0	13.7	292 20.7	110	26 28.9	+ 55
17	12 17.5	55 48.0	11.1	42 43.8	30.5	32 01.0	27.1	189 13.5	13.7	306 50.7	110	26 34.4	+ 54
18	27 20.0	70 47.3	−18 10.3	57 44.4	−13 29.8	47 02.9	− 9 26.9	204 16.0	+ 1 13.7	321 20.7	110	+26 39.8	+ 53
19	42 22.4	85 46.6	09.4	72 45.0	29.1	62 04.9	26.7	219 18.5	13.7	335 50.7	108	26 45.1	+ 52
20	57 24.9	100 45.9	08.5	87 45.5	28.4	77 06.9	26.5	234 21.0	13.8	350 20.5	109	26 50.3	+ 50
21	72 27.4	115 45.2	·· 07.6	102 46.1	·· 27.7	92 08.8	·· 26.3	249 23.5	·· 13.8	4 50.4	107	·26 55.3	+ 49
22	87 29.8	130 44.5	06.7	117 46.7	27.0	107 10.8	26.1	264 26.0	13.8	19 20.1	108	27 00.2	+ 48
23	102 32.3	145 43.8	05.8	132 47.2	26.3	122 12.8	25.9	279 28.4	13.8	33 49.9	106	27 05.0	+ 46
24	117 34.8	160 43.1	−18 05.0	147 47.8	−13 25.6	137 14.7	− 9 25.7	294 30.9	+ 1 13.9	48 19.5	106	+27 09.6	+ 45
code	—	− 7	+ 8	+ 6	+ 7	+ 20	+ 2	+ 24	0				

GCT h	SUN GHA ° ′	SUN Dec. ° ′
0	177 37.9	−21 07.9
1	192 37.7	07.4
2	207 37.5	07.0
3	222 37.3	•• 06.5
4	237 37.0	06.0
5	252 36.8	05.6
6	267 36.6	−21 05.1
7	282 36.4	04.7
8	297 36.2	04.2
9	312 36.0	•• 03.7
10	327 35.7	03.3
11	342 35.5	02.8
12	357 35.3	−21 02.3
13	12 35.1	01.9
14	27 34.9	01.4
15	42 34.7	•• 00.9
16	57 34.4	00.4
17	72 34.2	21 00.0
18	87 34.0	−20 59.5
19	102 33.8	59.0
20	117 33.6	58.6
21	132 33.4	•• 58.1
22	147 33.1	57.6
23	162 32.9	57.1
0	177 32.7	−20 56.7
1	192 32.5	56.2
2	207 32.3	55.7
3	222 32.1	•• 55.2
4	237 31.9	54.7
5	252 31.7	54.3
6	267 31.4	−20 53.8
7	282 31.2	53.3
8	297 31.0	52.8
9	312 30.8	•• 52.3
10	327 30.6	51.9
11	342 30.4	51.4
12	357 30.2	−20 50.9
13	12 30.0	50.4
14	27 29.8	49.9
15	42 29.6	•• 49.4
16	57 29.4	48.9
17	72 29.1	48.5
18	87 28.9	−20 48.0
19	102 28.7	47.5
20	117 28.5	47.0
21	132 28.3	•• 46.5
22	147 28.1	46.0
23	162 27.9	45.5
0	177 27.7	−20 45.0
1	192 27.5	44.5
2	207 27.3	44.0
3	222 27.1	•• 43.5
4	237 26.9	43.0
5	252 26.7	42.5
6	267 26.5	−20 42.0
7	282 26.3	41.6
8	297 26.1	41.1
9	312 25.9	•• 40.6
10	327 25.7	40.1
11	342 25.5	39.6
12	357 25.3	−20 39.1
13	12 25.1	38.6
14	27 24.8	38.1
15	42 24.6	•• 37.5
16	57 24.4	37.0
17	72 24.2	36.5
18	87 24.0	−20 36.0
19	102 23.8	35.5
20	117 23.6	35.0
21	132 23.4	•• 34.5
22	147 23.2	34.0
23	162 23.0	33.5
24	177 22.9	−20 33.0
code	—	+ 5

STARS No.	SHA ° ′	Dec. ° ′	Transit Mer. Gr. h m
1	358 32.4	+28 49.3	16 21
2	358 22.2	+58 53.0	16 21
3	349 43.0	−18 15.4	16 56
4	339 21.3	+59 59.2	17 37
5	336 01.4	−57 29.3	17 51
6	332 43.6	+89 02.5	18 04
7	328 53.8	+23 14.1	18 19
8	315 53.7	−40 30.1	19 11
9	309 47.6	+49 41.6	19 35
10	291 43.1	+16 24.9	20 47
11	281 56.9	− 8 15.3	21 26
12	281 43.5	+45 57.3	21 27
13	279 22.1	+ 6 18.5	21 37
14	279 11.7	+28 34.3	21 37
15	276 33.7	− 1 13.8	21 48
16	271 51.8	+ 7 24.1	22 06
17	264 16.5	−52 40.1	22 37
18	259 14.8	−16 38.8	22 57
19	255 49.1	−28 54.2	23 10
20	245 48.5	+ 5 21.2	23 50
21	244 24.7	+28 08.8	23 56
22	234 36.8	−59 21.0	0 39
23	223 26.7	−43 13.9	1 24
24	221 49.3	−69 30.7	1 30
25	218 41.9	− 8 26.7	1 42
26	208 33.1	+12 12.4	2 23
27	194 48.4	+62 00.7	3 18
28	183 21.3	+14 50.6	4 03
29	174 02.0	−62 49.5	4 41
30	172 53.4	−56 50.2	4 45
31	168 47.3	−59 25.1	5 02
32	167 01.4	+56 13.2	5 09
33	159 30.4	+55 10.5	5 39
34	159 20.8	−10 54.5	5 39
35	153 35.6	+49 33.0	6 02
36	149 03.2	−36 07.7	6 20
37	146 38.6	+19 25.9	6 30
38	140 56.4	−60 38.0	6 53
39	137 17.6	+74 20.9	7 07
40	126 50.9	+26 52.4	7 49
41	120 38.7	−22 29.1	8 14
42	113 24.2	−26 19.6	8 43
43	109 08.8	−68 56.4	9 00
44	103 06.7	−15 40.1	9 24
45	97 26.1	−37 04.3	9 46
46	96 50.3	+12 35.4	9 49
47	91 08.4	+51 29.3	10 11
48	84 46.5	−34 24.7	10 37
49	81 11.2	+38 44.0	10 51
50	76 56.8	−26 21.7	11 08
51	62 54.4	+ 8 44.1	12 04
52	54 33.6	−56 53.8	12 37
53	50 04.1	+45 06.2	12 55
54	34 33.6	+ 9 38.9	13 57
55	28 42.8	−47 12.2	14 20
56	16 15.9	−29 53.1	15 10
57	14 25.4	+14 56.5	15 17

Lat. °	Sunrise h m	Twlt. begins h m	Moonrise 16 h m	17 h m	18 h m	19 h m
N 70	12 02	6 28	8 21	▭	▭	▭
68	10 27	6 26	9 02	▭	▭	▭
66	9 49	6 21	9 31	8 54	▭	▭
64	9 23	6 17	9 53	9 36	8 55	▭
62	9 02	6 14	10 10	10 04	9 57	9 42
60	8 46	6 10	10 25	10 27	10 32	10 46
58	8 32	6 07	10 37	10 45	10 57	11 20
56	8 20	6 05	10 48	11 00	11 17	11 45
54	8 09	6 01	10 58	11 13	11 34	12 05
52	8 00	5 59	11 07	11 24	11 48	12 22
50	7 52	5 57	11 14	11 34	12 01	12 36
45	7 34	5 51	11 31	11 56	12 27	13 06
40	7 20	5 44	11 45	12 13	12 47	13 29
35	7 07	5 39	11 56	12 28	13 05	13 48
30	6 57	5 33	12 06	12 41	13 20	14 04
20	6 38	5 21	12 24	13 03	13 45	14 32
10	6 22	5 07	12 40	13 22	14 07	14 56
0	6 06	4 52	12 54	13 40	14 28	15 19
10	5 51	4 34	13 09	13 58	14 49	15 41
20	5 34	4 11	13 25	14 17	15 11	16 05
30	5 15	3 41	13 43	14 40	15 37	16 33
35	5 03	3 20	13 54	14 53	15 53	16 50
40	4 50	2 53	14 06	15 09	16 10	17 09
45	4 35	2 15	14 21	15 27	16 32	17 33
50	4 15	1 04	14 39	15 50	17 00	18 03
52	4 06	////	14 47	16 01	17 13	18 19
54	3 56	////	14 57	16 14	17 29	18 36
56	3 44	////	15 07	16 29	17 48	18 58
58	3 31	////	15 20	16 46	18 10	19 25
60	3 14	////	15 34	17 07	18 40	20 05
S						

Lat. °	Sunset h m	Twlt. ends h m	Moonset 16 h m	17 h m	18 h m	19 h m
N 70	12 20	17 52	4 46	▭	▭	▭
68	13 54	17 57	4 05	▭	▭	▭
66	14 32	18 01	3 38	5 48	▭	▭
64	14 58	18 05	3 17	5 07	7 27	▭
62	15 18	18 08	3 01	4 39	6 25	8 24
60	15 35	18 11	2 47	4 18	5 51	7 21
58	15 49	18 14	2 35	4 01	5 26	6 47
56	16 01	18 17	2 25	3 46	5 07	6 22
54	16 11	18 19	2 16	3 34	4 50	6 02
52	16 20	18 21	2 08	3 23	4 36	5 45
50	16 29	18 25	2 01	3 13	4 24	5 31
45	16 46	18 30	1 46	2 53	3 59	5 02
40	17 01	18 36	1 33	2 36	3 39	4 39
35	17 13	18 42	1 23	2 22	3 22	4 20
30	17 24	18 48	1 14	2 10	3 08	4 04
20	17 42	18 59	0 58	1 50	2 43	3 37
10	17 58	19 12	0 44	1 32	2 22	3 14
0	18 14	19 28	0 32	1 16	2 03	2 52
10	18 29	19 45	0 19	1 00	1 43	2 30
20	18 45	20 07	0 05	0 42	1 22	2 07
30	19 05	20 38	24 22	0 22	0 59	1 40
35	19 16	20 58	24 10	0 10	0 44	1 24
40	19 29	21 24	23 57	24 28	0 28	1 06
45	19 45	22 02	23 41	24 09	0 09	0 44
50	20 04	23 10	23 22	23 45	24 15	0 15
52	20 13	////	23 13	23 33	24 02	0 02
54	20 23	////	23 03	23 20	23 46	24 24
56	20 35	////	22 52	23 05	23 27	24 02
58	20 48	////	22 39	22 47	23 04	23 35
60	21 04	////	22 23	22 26	22 33	22 55
S						

GCT h	Equation of Time (App.—Mean) 16 m s	17 m s	18 m s
0	− 9 27.9	− 9 48.7	−10 08.8
6	− 9 33.1	− 9 53.8	−10 13.7
12	− 9 38.4	− 9 58.8	−10 18.6
18	− 9 43.6	−10 03.9	−10 23.4
24	− 9 48.7	−10 08.8	−10 28.2

GCT of Transit Meridian of Greenwich

DAY	Moon h m	Venus h m	Mars h m	Jupiter h m	Saturn h m
16	19 05	13 14	14 11	14 59	4 33
17	19 51	13 16	14 10	14 55	4 29
18	20 40	13 17	14 09	14 52	4 25
19	21 31	13 18	14 08	14 49	4 21

ADDITIONAL ALTITUDE CORRECTIONS

Alt. °	Sun's Low'r Limb ′	Venus ′	Mars ′
0			
	0.6	0.1	0.1
30			
	0.6	0.1	0.1
45			
	0.6	0.1	0.0
60			
	0.6	0.0	0.0
75			
	0.6	0.0	0.0
90			

Moon's Lower Limb
Add

Alt. °	16 ′	17 ′	18 ′
0			
	12.2	12.0	11.9
4			
	12.3	12.0	11.9
8			
	12.3	12.0	11.9
12			
	12.3	12.1	11.9
16			
	12.4	12.1	12.0
20			
	12.4	12.2	12.1
24			
	12.5	12.3	12.2
28			
	12.6	12.4	12.2
32			
	12.7	12.5	12.4
36			
	12.8	12.6	12.5
40			
	12.9	12.7	12.6
44			
	13.0	12.8	12.7
48			
	13.2	13.0	12.9
52			
	13.3	13.1	13.1
56			
	13.5	13.3	13.2
60			
	13.6	13.5	13.4
64			
	13.8	13.6	13.6
68			
	14.0	13.8	13.8
72			
	14.1	14.0	14.0
76			
	14.3	14.2	14.2
80			
	14.5	14.4	14.4
84			
	14.7	14.6	14.6
88			
	14.8	14.7	14.7
90			

Add to table, back cover

Moon's Upper Limb
Subtract

Alt. °	16 ′	17 ′	18 ′
0			
	17.4	17.6	17.7
4			
	17.4	17.6	17.6
8			
	17.4	17.5	17.6
12			
	17.4	17.5	17.6
16			
	17.3	17.5	17.5
20			
	17.3	17.4	17.5
24			
	17.2	17.3	17.4
28			
	17.1	17.2	17.3
32			
	17.0	17.1	17.2
36			
	16.9	17.0	17.0
40			
	16.8	16.9	16.9
44			
	16.6	16.7	16.8
48			
	16.5	16.6	16.6
52			
	16.4	16.4	16.5
56			
	16.2	16.3	16.3
60			
	16.1	16.1	16.1
64			
	15.9	15.9	15.9
68			
	15.7	15.7	15.8
72			
	15.6	15.6	15.6
76			
	15.4	15.4	15.4
80			
	15.2	15.2	15.2
84			
	15.0	15.0	15.0
88			
	14.9	14.8	14.8
90			

Subtract from table, back cover

G C T	♈ GHA	VENUS −3.3 GHA	VENUS Dec.	MARS 1.4 GHA	MARS Dec.	JUPITER −1.7 GHA	JUPITER Dec.	SATURN 1.0 GHA	SATURN Dec.	MOON GHA	code	MOON Dec.	code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
0	117 34.8	160 43.1	−18 05.0	147 47.8	−13 25.6	137 14.7	− 9 25.7	294 30.9	+ 1 13.9	48 19.5	106	+27 09.6	+ 45
1	132 37.2	175 42.4	04.1	162 48.4	24.9	152 16.7	25.5	309 33.4	13.9	62 49.1	106	27 14.1	+ 44
2	147 39.7	190 41.7	03.2	177 49.0	24.2	167 18.7	25.3	324 35.9	13.9	77 18.7	105	27 18.5	+ 43
3	162 42.2	205 41.0	·· 02.3	192 49.5	·· 23.5	182 20.6	·· 25.1	339 38.4	·· 13.9	91 48.2	105	·27 22.8	+ 42
4	177 44.6	220 40.3	01.4	207 50.1	22.8	197 22.6	24.9	354 40.9	13.9	106 17.7	104	27 27.0	+ 40
5	192 47.1	235 39.6	18 00.5	222 50.7	22.1	212 24.6	24.7	9 43.4	14.0	120 47.1	104	27 31.0	+ 39
6	207 49.5	250 39.0	−17 59.6	237 51.2	−13 21.4	227 26.5	− 9 24.5	24 45.9	+ 1 14.0	135 16.5	103	+27 34.9	+ 37
7	222 52.0	265 38.3	58.7	252 51.8	20.7	242 28.5	24.3	39 48.4	14.0	149 45.8	103	27 38.6	+ 36
8	237 54.5	280 37.6	57.8	267 52.4	20.0	257 30.5	24.1	54 50.8	14.0	164 15.1	102	27 42.2	+ 35
9	252 56.9	295 36.9	·· 57.0	282 53.0	·· 19.4	272 32.4	·· 23.9	69 53.3	·· 14.1	178 44.3	102	·27 45.7	+ 34
10	267 59.4	310 36.2	56.1	297 53.5	18.7	287 34.4	23.7	84 55.8	14.1	193 13.5	102	27 49.1	+ 32
11	283 01.9	325 35.5	55.2	312 54.1	18.0	302 36.3	23.5	99 58.3	14.1	207 42.7	101	27 52.3	+ 31
12	298 04.3	340 34.8	−17 54.3	327 54.7	−13 17.3	317 38.3	− 9 23.3	115 00.8	+ 1 14.1	222 11.8	101	+27 55.4	+ 30
13	313 06.8	355 34.1	53.4	342 55.2	16.6	332 40.3	23.1	130 03.3	14.2	236 40.9	100	27 58.4	+ 28
14	328 09.3	10 33.5	52.5	357 55.8	15.9	347 42.2	22.9	145 05.8	14.2	251 09.9	100	28 01.2	+ 27
15	343 11.7	25 32.8	·· 51.6	12 56.4	·· 15.2	2 44.2	·· 22.7	160 08.3	·· 14.2	265 38.9	99	·28 03.9	+ 25
16	358 14.2	40 32.1	50.7	27 57.0	14.5	17 46.2	22.5	175 10.8	14.2	280 07.8	100	28 06.4	+ 24
17	13 16.7	55 31.4	49.8	42 57.5	13.8	32 48.1	22.3	190 13.3	14.3	294 36.8	98	28 08.8	+ 23
18	28 19.1	70 30.7	−17 48.9	57 58.1	−13 13.1	47 50.1	− 9 22.1	205 15.8	+ 1 14.3	309 05.6	99	+28 11.1	+ 22
19	43 21.6	85 30.0	48.0	72 58.7	12.4	62 52.1	21.9	220 18.2	14.3	323 34.5	98	28 13.3	+ 20
20	58 24.0	100 29.3	47.1	87 59.3	11.7	77 54.0	21.7	235 20.7	14.3	338 03.3	98	28 15.3	+ 19
21	73 26.5	115 28.7	·· 46.2	102 59.8	·· 11.0	92 56.0	·· 21.5	250 23.2	·· 14.4	352 32.1	97	·28 17.2	+ 17
22	88 29.0	130 28.0	45.3	118 00.4	10.3	107 58.0	21.3	265 25.7	14.4	7 00.8	98	28 18.9	+ 16
23	103 31.4	145 27.3	44.4	133 01.0	09.6	122 59.9	21.1	280 28.2	14.4	21 29.6	97	28 20.5	+ 15
0	118 33.9	160 26.6	−17 43.5	148 01.6	−13 08.9	138 01.9	− 9 20.9	295 30.7	+ 1 14.4	35 58.3	96	+28 22.0	+ 13
1	133 36.4	175 25.9	42.6	163 02.1	08.2	153 03.8	20.7	310 33.2	14.5	50 26.9	97	28 23.3	+ 12
2	148 38.8	190 25.3	41.7	178 02.7	07.5	168 05.8	20.5	325 35.7	14.5	64 55.6	96	28 24.5	+ 10
3	163 41.3	205 24.6	·· 40.7	193 03.3	·· 06.8	183 07.8	·· 20.2	340 38.2	·· 14.5	79 24.2	96	·28 25.5	+ 9
4	178 43.8	220 23.9	39.8	208 03.9	06.1	198 09.7	20.0	355 40.7	14.5	93 52.8	96	28 26.4	+ 8
5	193 46.2	235 23.2	38.9	223 04.4	05.4	213 11.7	19.8	10 43.2	14.6	108 21.4	95	28 27.2	+ 6
6	208 48.7	250 22.5	−17 38.0	238 05.0	−13 04.7	228 13.7	− 9 19.6	25 45.7	+ 1 14.6	122 49.9	95	+28 27.8	+ 5
7	223 51.1	265 21.9	37.1	253 05.6	04.0	243 15.6	19.4	40 48.1	14.6	137 18.4	96	28 28.3	+ 3
8	238 53.6	280 21.2	36.2	268 06.2	03.3	258 17.6	19.2	55 50.6	14.6	151 47.0	95	28 28.6	+ 2
9	253 56.1	295 20.5	·· 35.3	283 06.7	·· 02.6	273 19.5	·· 19.0	70 53.1	·· 14.7	166 15.5	94	·28 28.8	+ 1
10	268 58.5	310 19.8	34.4	298 07.3	01.9	288 21.5	18.8	85 55.6	14.7	180 43.9	95	28 28.9	− 1
11	284 01.0	325 19.2	33.4	313 07.9	01.2	303 23.5	18.6	100 58.1	14.7	195 12.4	95	28 28.8	− 2
12	299 03.5	340 18.5	−17 32.5	328 08.5	−13 00.4	318 25.4	− 9 18.4	116 00.6	+ 1 14.7	209 40.9	94	+28 28.6	− 4
13	314 05.9	355 17.8	31.6	343 09.0	12 59.7	333 27.4	18.2	131 03.1	14.8	224 09.3	94	28 28.2	− 5
14	329 08.4	10 17.2	30.7	358 09.6	59.0	348 29.4	18.0	146 05.6	14.8	238 37.7	95	28 27.7	− 6
15	344 10.9	25 16.5	·· 29.8	13 10.2	·· 58.3	3 31.3	·· 17.8	161 08.1	·· 14.8	253 06.2	94	·28 27.1	− 8
16	359 13.3	40 15.8	28.9	28 10.8	57.6	18 33.3	17.6	176 10.6	14.8	267 34.6	94	28 26.3	− 9
17	14 15.8	55 15.1	27.9	43 11.4	56.9	33 35.2	17.4	191 13.1	14.9	282 03.0	94	28 25.4	− 11
18	29 18.3	70 14.5	−17 27.0	58 11.9	−12 56.2	48 37.2	− 9 17.2	206 15.6	+ 1 14.9	296 31.4	94	+28 24.3	− 12
19	44 20.7	85 13.8	26.1	73 12.5	55.5	63 39.2	17.0	221 18.1	14.9	310 59.8	94	28 23.1	− 14
20	59 23.2	100 13.1	25.2	88 13.1	54.8	78 41.1	16.8	236 20.6	14.9	325 28.2	94	28 21.7	− 15
21	74 25.6	115 12.5	·· 24.2	103 13.7	·· 54.1	93 43.1	·· 16.6	251 23.1	·· 15.0	339 56.6	94	·28 20.2	− 16
22	89 28.1	130 11.8	23.3	118 14.2	53.4	108 45.0	16.4	266 25.6	15.0	354 25.0	94	28 18.6	− 18
23	104 30.6	145 11.1	22.4	133 14.8	52.7	123 47.0	16.2	281 28.1	15.0	8 53.4	94	28 16.8	− 19
0	119 33.0	160 10.5	−17 21.5	148 15.4	−12 52.0	138 49.0	− 9 16.0	296 30.6	+ 1 15.0	23 21.8	94	+28 14.9	− 21
1	134 35.5	175 09.8	20.5	163 16.0	51.3	153 50.9	15.8	311 33.1	15.1	37 50.2	94	28 12.8	− 22
2	149 38.0	190 09.1	19.6	178 16.6	50.6	168 52.9	15.6	326 35.6	15.1	52 18.6	94	28 10.6	− 23
3	164 40.4	205 08.5	·· 18.7	193 17.1	·· 49.9	183 54.9	·· 15.4	341 38.1	·· 15.1	66 47.0	95	·28 08.3	− 25
4	179 42.9	220 07.8	17.8	208 17.7	49.2	198 56.8	15.2	356 40.6	15.2	81 15.5	94	28 05.8	− 27
5	194 45.4	235 07.1	16.8	223 18.3	48.5	213 58.8	14.9	11 43.1	15.2	95 43.9	94	28 03.1	− 27
6	209 47.8	250 06.5	−17 15.9	238 18.9	−12 47.8	229 00.7	− 9 14.7	26 45.5	+ 1 15.2	110 12.3	95	+28 00.4	− 30
7	224 50.3	265 05.8	15.0	253 19.5	47.1	244 02.7	14.5	41 48.0	15.2	124 40.8	95	27 57.4	− 30
8	239 52.8	280 05.1	14.0	268 20.0	46.3	259 04.7	14.3	56 50.5	15.3	139 09.3	95	27 54.4	− 32
9	254 55.2	295 04.5	·· 13.1	283 20.6	·· 45.6	274 06.6	·· 14.1	71 53.0	·· 15.3	153 37.8	95	·27 51.2	− 33
10	269 57.7	310 03.8	12.2	298 21.2	44.9	289 08.6	13.9	86 55.5	15.3	168 06.3	95	27 47.9	− 35
11	285 00.1	325 03.2	11.2	313 21.8	44.2	304 10.5	13.7	101 58.0	15.3	182 34.8	95	27 44.4	− 36
12	300 02.6	340 02.5	−17 10.3	328 22.4	−12 43.5	319 12.5	− 9 13.5	117 00.5	+ 1 15.4	197 03.3	96	+27 40.8	− 38
13	315 05.1	355 01.8	09.4	343 23.0	42.8	334 14.5	13.3	132 03.0	15.4	211 31.9	96	27 37.0	− 39
14	330 07.5	10 01.2	08.4	358 23.5	42.1	349 16.4	13.1	147 05.5	15.4	226 00.5	96	27 33.1	− 40
15	345 10.0	25 00.5	·· 07.5	13 24.1	·· 41.4	4 18.4	·· 12.9	162 08.0	·· 15.5	240 29.1	96	·27 29.1	− 42
16	0 12.5	39 59.9	06.5	28 24.7	40.7	19 20.3	12.7	177 10.5	15.5	254 57.7	96	27 24.9	− 43
17	15 14.9	54 59.2	05.6	43 25.3	40.0	34 22.3	12.5	192 13.0	15.5	269 26.3	97	27 20.6	− 45
18	30 17.4	69 58.6	−17 04.7	58 25.9	−12 39.3	49 24.2	− 9 12.3	207 15.5	+ 1 15.5	283 55.0	97	+27 16.1	− 46
19	45 19.9	84 57.9	03.7	73 26.4	38.6	64 26.2	12.1	222 18.0	15.6	298 23.7	98	27 11.5	− 47
20	60 22.3	99 57.2	02.8	88 27.0	37.8	79 28.2	11.9	237 20.5	15.6	312 52.5	97	27 06.8	− 49
21	75 24.8	114 56.6	·· 01.8	103 27.6	·· 37.1	94 30.1	·· 11.7	252 23.0	·· 15.6	327 21.2	98	·27 01.9	− 50
22	90 27.3	129 55.9	17 00.9	118 28.2	36.4	109 32.1	11.5	267 25.5	15.6	341 50.0	98	26 56.9	− 51
23	105 29.7	144 55.3	16 59.9	133 28.8	35.7	124 34.0	11.3	282 28.0	15.7	356 18.8	99	26 51.8	− 53
24	120 32.2	159 54.6	−16 59.0	148 29.4	−12 35.0	139 36.0	− 9 11.0	297 30.5	+ 1 15.7	10 47.7	99	+26 46.5	− 54
code	—	− 7	+ 9	+ 5	+ 7	+ 20	+ 2	+ 25	+ 1				

GCT	SUN GHA	SUN Dec.
h	° ′	° ′
0	177 22.9	−20 33.0
1	192 22.7	32.5
2	207 22.5	32.0
3	222 22.3	31.5
4	237 22.1	30.9
5	252 21.9	30.4
6	267 21.7	−20 29.9
7	282 21.5	29.4
8	297 21.3	28.9
9	312 21.1	28.4
10	327 20.9	27.9
11	342 20.7	27.3
12	357 20.5	−20 26.8
13	12 20.3	26.3
14	27 20.1	25.8
15	42 19.9	25.3
16	57 19.7	24.8
17	72 19.5	24.2
18	87 19.3	−20 23.7
19	102 19.1	23.2
20	117 19.0	22.7
21	132 18.8	22.1
22	147 18.6	21.6
23	162 18.4	21.1
0	177 18.2	−20 20.6
1	192 18.0	20.1
2	207 17.8	19.5
3	222 17.6	19.0
4	237 17.4	18.5
5	252 17.2	17.9
6	267 17.0	−20 17.4
7	282 16.9	16.9
8	297 16.7	16.4
9	312 16.5	15.8
10	327 16.3	15.3
11	342 16.1	14.8
12	357 15.9	−20 14.2
13	12 15.7	13.7
14	27 15.6	13.2
15	42 15.4	12.6
16	57 15.2	12.1
17	72 15.0	11.5
18	87 14.8	−20 11.0
19	102 14.6	10.5
20	117 14.4	09.9
21	132 14.3	09.4
22	147 14.1	08.9
23	162 13.9	08.3
0	177 13.7	−20 07.8
1	192 13.5	07.2
2	207 13.3	06.7
3	222 13.2	06.2
4	237 13.0	05.6
5	252 12.8	05.1
6	267 12.6	−20 04.5
7	282 12.4	04.0
8	297 12.3	03.4
9	312 12.1	02.9
10	327 11.9	02.3
11	342 11.7	01.8
12	357 11.5	−20 01.2
13	12 11.4	00.7
14	27 11.2	20 00.1
15	42 11.0	·19 59.6
16	57 10.8	59.0
17	72 10.7	58.5
18	87 10.5	−19 57.9
19	102 10.3	57.4
20	117 10.1	56.8
21	132 10.0	56.3
22	147 09.8	55.7
23	162 09.6	55.2
24	177 09.4	−19 54.6
code	−	+ 5

STARS No.	SHA	Dec.	Transit Mer. Gr.
	° ′	° ′	h m
1	358 32.4	+28 49.3	16 09
2	358 22.2	+58 53.0	16 10
3	349 43.0	−18 15.4	16 44
4	339 21.3	+59 59.2	17 25
5	336 01.4	−57 29.3	17 39
6	332 44.6	+89 02.5	17 52
7	328 53.9	+23 14.1	18 07
8	315 53.7	−40 30.1	18 59
9	309 47.6	+49 41.6	19 23
10	291 43.1	+16 24.9	20 35
11	281 56.9	− 8 15.4	21 14
12	281 43.5	+45 57.3	21 15
13	279 22.1	+ 6 18.5	21 25
14	279 11.7	+28 34.3	21 25
15	276 33.7	− 1 13.8	21 36
16	271 51.8	+ 7 24.1	21 55
17	264 16.5	−52 40.1	22 25
18	259 14.8	−16 38.8	22 45
19	255 49.1	−28 54.2	22 59
20	245 48.5	+ 5 21.2	23 39
21	244 24.7	+28 08.8	23 44
22	234 36.8	−59 21.0	0 27
23	223 26.7	−43 13.9	1 12
24	221 49.3	−69 30.8	1 18
25	218 41.9	− 8 26.7	1 31
26	208 33.1	+12 12.4	2 11
27	194 48.3	+62 00.7	3 06
28	183 21.3	+14 50.6	3 52
29	174 02.0	−62 49.5	4 29
30	172 53.4	−56 50.2	4 33
31	168 47.3	−59 25.1	4 50
32	167 01.4	+56 13.2	4 57
33	159 30.3	+55 10.4	5 27
34	159 20.8	−10 54.5	5 27
35	153 35.6	+49 33.0	5 50
36	149 03.2	−36 07.8	6 09
37	146 38.5	+19 25.9	6 18
38	140 56.4	−60 38.0	6 41
39	137 17.6	+74 20.9	6 55
40	126 50.9	+26 52.4	7 37
41	120 38.6	−22 29.1	8 02
42	113 24.2	−26 19.6	8 31
43	109 08.7	−68 56.4	8 48
44	103 06.7	−15 40.1	9 12
45	97 26.1	−37 04.3	9 34
46	96 50.3	+12 35.4	9 37
47	91 08.4	+51 29.3	10 00
48	84 46.4	−34 24.7	10 25
49	81 11.2	+38 44.0	10 39
50	76 56.8	−26 21.7	10 56
51	62 54.4	+ 8 44.1	11 52
52	54 33.6	−56 53.8	12 25
53	50 04.1	+45 06.2	12 43
54	34 33.6	+ 9 38.9	13 45
55	28 42.8	−47 12.2	14 09
56	16 15.9	−29 53.1	14 58
57	14 25.4	+14 56.5	15 06

Lat.	Sunrise	Twlt. begins	Moonrise 19	Moonrise 20	Moonrise 21	Moonrise 22
N °	h m	h m	h m	h m	h m	h m
70	11 12	6 25	□	□	□	□
68	10 13	6 21	□	□	□	□
66	9 40	6 17	□	□	□	□
64	9 15	6 14	□	□	□	12 36
62	8 56	6 10	9 42	□	11 31	13 35
60	8 41	6 07	10 46	11 23	12 35	14 08
58	8 27	6 05	11 20	12 02	13 09	14 32
56	8 16	6 02	11 45	12 29	13 33	14 51
54	8 06	5 59	12 05	12 51	13 53	15 08
52	7 57	5 57	12 22	13 09	14 10	15 22
50	7 49	5 55	12 36	13 24	14 24	15 34
45	7 32	5 49	13 06	13 55	14 53	15 59
40	7 18	5 44	13 29	14 19	15 16	16 19
35	7 06	5 38	13 48	14 38	15 35	16 35
30	6 56	5 32	14 04	14 55	15 51	16 50
20	6 38	5 21	14 32	15 23	16 18	17 14
10	6 22	5 08	14 56	15 48	16 41	17 35
0	6 07	4 54	15 19	16 11	17 03	17 54
10	5 52	4 36	15 41	16 33	17 24	18 13
20	5 36	4 14	16 05	16 58	17 48	18 34
30	5 17	3 45	16 33	17 26	18 15	18 58
35	5 06	3 24	16 50	17 43	18 30	19 12
40	4 54	2 59	17 09	18 03	18 49	19 28
45	4 39	2 22	17 33	18 27	19 11	19 47
50	4 20	1 20	18 03	18 57	19 39	20 11
52	4 11	////	18 19	19 13	19 53	20 22
54	4 01	////	18 36	19 30	20 09	20 35
56	3 50	////	18 58	19 52	20 28	20 50
58	3 37	////	19 25	20 19	20 51	21 08
60	3 22	////	20 05	20 59	21 21	21 29
S						

Lat.	Sunset	Twlt. ends	Moonset 19	Moonset 20	Moonset 21	Moonset 22
N °	h m	h m	h m	h m	h m	h m
70	13 11	18 01	□	□	□	□
68	14 10	18 05	□	□	□	□
66	14 43	18 07	□	□	□	□
64	15 07	18 10	□	□	□	10 55
62	15 26	18 13	8 24	□	10 11	9 56
60	15 42	18 16	7 21	8 31	9 09	9 23
58	15 55	18 19	6 47	7 52	8 35	8 58
56	16 06	18 21	6 22	7 25	8 09	8 38
54	16 16	18 23	6 02	7 03	7 49	8 21
52	16 25	18 26	5 45	6 45	7 32	8 07
50	16 33	18 28	5 31	6 30	7 18	7 55
45	16 50	18 33	5 02	5 59	6 48	7 29
40	17 04	18 39	4 39	5 35	6 25	7 08
35	17 16	18 44	4 20	5 16	6 06	6 51
30	17 26	18 49	4 04	4 59	5 50	6 36
20	17 44	19 01	3 37	4 31	5 22	6 10
10	18 00	19 14	3 14	4 06	4 58	5 48
0	18 15	19 28	2 52	3 43	4 36	5 28
10	18 29	19 45	2 30	3 21	4 13	5 07
20	18 45	20 06	2 07	2 56	3 49	4 45
30	19 04	20 36	1 40	2 28	3 21	4 19
35	19 15	20 56	1 24	2 11	3 04	4 03
40	19 28	21 21	1 06	1 52	2 45	3 45
45	19 42	21 56	0 44	1 28	2 21	3 24
50	20 01	22 57	0 15	0 57	1 51	2 56
52	20 10	////	0 02	0 42	1 36	2 43
54	20 19	////	24 24	0 24	1 18	2 27
56	20 30	////	24 02	0 02	0 57	2 09
58	20 43	////	23 35	24 29	0 29	1 46
60	20 58	////	22 55	23 50	25 16	1 16
S						

GCT	Equation of Time (App.—Mean) 19	20	21
h	m s	m s	m s
0	−10 28.2	−10 46.9	−11 04.8
6	−10 32.9	−10 51.4	−11 09.2
12	−10 37.6	−10 55.9	−11 13.5
18	−10 42.3	−11 00.4	−11 17.7
24	−10 46.9	−11 04.8	−11 22.0

GCT of Transit Meridian of Greenwich

DAY	Moon	Venus	Mars	Jupiter	Saturn
	h m	h m	h m	h m	h m
19	21 31	13 18	14 08	14 49	4 21
20	22 23	13 19	14 07	14 46	4 17
21	23 15	13 20	14 06	14 43	4 13
22	24 06	13 21	14 06	14 40	4 09

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb	Venus	Mars
°	′	′	′
0			
	0.6	0.1	0.1
30			
	0.6	0.1	0.1
45			
	0.6	0.1	0.0
60			
	0.6	0.0	0.0
75			
	0.6	0.0	0.0
90			

Moon's Lower Limb
Add

Alt.	19	20	21
°	′	′	′
0			
	11.9	12.1	12.5
4			
	11.9	12.1	12.5
8			
	11.9	12.2	12.5
12			
	11.9	12.2	12.6
16			
	12.0	12.2	12.6
20			
	12.1	12.3	12.7
24			
	12.2	12.4	12.7
28			
	12.2	12.5	12.8
32			
	12.4	12.6	12.9
36			
	12.5	12.7	13.0
40			
	12.6	12.8	13.1
44			
	12.7	12.9	13.2
48			
	12.9	13.1	13.4
52			
	13.1	13.2	13.5
56			
	13.2	13.4	13.6
60			
	13.4	13.5	13.8
64			
	13.6	13.7	13.9
68			
	13.8	13.9	14.1
72			
	14.0	14.1	14.2
76			
	14.2	14.3	14.4
80			
	14.4	14.4	14.6
84			
	14.6	14.6	14.7
88			
	14.7	14.8	14.9
90			

Add to table, back cover

Moon's Upper Limb
Subtract

Alt.	19	20	21
°	′	′	′
0			
	17.7	17.5	17.3
4			
	17.6	17.5	17.3
8			
	17.6	17.5	17.3
12			
	17.6	17.4	17.2
16			
	17.5	17.4	17.2
20			
	17.5	17.3	17.1
24			
	17.4	17.2	17.1
28			
	17.3	17.2	17.0
32			
	17.2	17.1	16.9
36			
	17.0	16.9	16.8
40			
	16.9	16.8	16.7
44			
	16.8	16.7	16.6
48			
	16.6	16.6	16.4
52			
	16.5	16.4	16.3
56			
	16.3	16.2	16.2
60			
	16.1	16.1	16.0
64			
	15.9	15.9	15.9
68			
	15.8	15.7	15.7
72			
	15.6	15.6	15.6
76			
	15.4	15.4	15.4
80			
	15.2	15.2	15.2
84			
	15.0	15.0	15.1
88			
	14.8	14.9	14.9
90			

Subtract from table, back cover

Septuagesima Sunday 21

833190°—50——2

G C T	♈	VENUS −3.3		MARS 1.4		JUPITER −1.7		SATURN 1.0		MOON			
	GHA	GHA	Dec.	GHA	Dec.	GHA	Dec.	GHA	Dec.	GHA	code	Dec.	code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
0	120 32.2	159 54.6	−16 59.0	148 29.4	−12 35.0	139 36.0	− 9 11.0	297 30.5	+ 1 15.7	10 47.7	99	+26 46.5	− 54
1	135 34.6	174 54.0	58.1	163 29.9	34.3	154 38.0	10.8	312 33.0	15.7	25 16.6	99	26 41.1	− 56
2	150 37.1	189 53.3	57.1	178 30.5	33.6	169 39.9	10.6	327 35.5	15.8	39 45.5	99	26 35.5	− 56
3	165 39.6	204 52.7	·· 56.2	193 31.1	·· 32.9	184 41.9	·· 10.4	342 38.0	·· 15.8	54 14.4	100	·26 29.9	− 59
4	180 42.0	219 52.0	55.2	208 31.7	32.2	199 43.8	10.2	357 40.5	15.8	68 43.4	101	26 24.0	− 59
5	195 44.5	234 51.4	54.3	223 32.3	31.4	214 45.8	10.0	12 43.0	15.8	83 12.5	100	26 18.1	− 61
6	210 47.0	249 50.7	−16 53.3	238 32.9	−12 30.7	229 47.7	− 9 09.8	27 45.5	+ 1 15.9	97 41.5	101	+26 12.0	− 62
7	225 49.4	264 50.1	52.4	253 33.5	30.0	244 49.7	09.6	42 48.0	15.9	112 10.6	102	26 05.8	− 64
8	240 51.9	279 49.4	51.4	268 34.0	29.3	259 51.7	09.4	57 50.5	15.9	126 39.8	102	25 59.4	− 64
9	255 54.4	294 48.8	·· 50.4	283 34.6	·· 28.6	274 53.6	·· 09.2	72 53.0	·· 16.0	141 09.0	102	·25 53.0	− 66
10	270 56.8	309 48.1	49.5	298 35.2	27.9	289 55.6	09.0	87 55.5	16.0	155 38.2	103	25 46.4	− 68
11	285 59.3	324 47.5	48.5	313 35.8	27.2	304 57.5	08.8	102 58.0	16.0	170 07.5	103	25 39.6	− 69
12	301 01.8	339 46.8	−16 47.6	328 36.4	−12 26.5	319 59.5	− 9 08.6	118 00.6	+ 1 16.0	184 36.8	103	+25 32.7	− 69
13	316 04.2	354 46.2	46.6	343 37.0	25.8	335 01.4	08.4	133 03.1	16.1	199 06.1	104	25 25.8	− 72
14	331 06.7	9 45.5	45.7	358 37.6	25.0	350 03.4	08.2	148 05.6	16.1	213 35.5	105	25 18.6	− 72
15	346 09.1	24 44.9	·· 44.7	13 38.1	·· 24.3	5 05.4	·· 08.0	163 08.1	·· 16.1	228 05.0	105	·25 11.4	− 74
16	1 11.6	39 44.2	43.8	28 38.7	23.6	20 07.3	07.8	178 10.6	16.2	242 34.5	105	25 04.0	− 75
17	16 14.1	54 43.6	42.8	43 39.3	22.9	35 09.3	07.5	193 13.1	16.2	257 04.0	106	24 56.5	− 76
18	31 16.5	69 43.0	−16 41.8	58 39.9	−12 22.2	50 11.2	− 9 07.3	208 15.6	+ 1 16.2	271 33.6	106	+24 48.9	− 78
19	46 19.0	84 42.3	40.9	73 40.5	21.5	65 13.2	07.1	223 18.1	16.3	286 03.2	107	24 41.1	− 79
20	61 21.5	99 41.7	39.9	88 41.1	20.8	80 15.1	06.9	238 20.6	16.3	300 32.9	108	24 33.2	− 80
21	76 23.9	114 41.0	·· 38.9	103 41.7	·· 20.0	95 17.1	·· 06.7	253 23.1	·· 16.3	315 02.7	107	·24 25.2	− 81
22	91 26.4	129 40.4	38.0	118 42.2	19.3	110 19.1	06.5	268 25.6	16.3	329 32.4	109	24 17.1	− 83
23	106 28.9	144 39.8	37.0	133 42.8	18.6	125 21.0	06.3	283 28.1	16.4	344 02.3	108	24 08.8	− 83
0	121 31.3	159 39.1	−16 36.1	148 43.4	−12 17.9	140 23.0	− 9 06.1	298 30.6	+ 1 16.4	358 32.1	110	+24 00.5	− 85
1	136 33.8	174 38.5	35.1	163 44.0	17.2	155 24.9	05.9	313 33.1	16.4	13 02.1	110	23 52.0	− 86
2	151 36.2	189 37.8	34.1	178 44.6	16.5	170 26.9	05.7	328 35.6	16.5	27 32.1	110	23 43.4	− 87
3	166 38.7	204 37.2	·· 33.2	193 45.2	·· 15.7	185 28.8	·· 05.5	343 38.1	·· 16.5	42 02.1	111	·23 34.7	− 89
4	181 41.2	219 36.6	32.2	208 45.8	15.0	200 30.8	05.3	358 40.6	16.5	56 32.2	111	23 25.8	− 90
5	196 43.6	234 35.9	31.2	223 46.4	14.3	215 32.7	05.1	13 43.1	16.6	71 02.3	112	23 16.8	− 90
6	211 46.1	249 35.3	−16 30.2	238 47.0	−12 13.6	230 34.7	− 9 04.9	28 45.6	+ 1 16.6	85 32.5	113	+23 07.8	− 92
7	226 48.6	264 34.7	29.3	253 47.5	12.9	245 36.7	04.7	43 48.1	16.6	100 02.8	113	22 58.6	− 93
8	241 51.0	279 34.0	28.3	268 48.1	12.2	260 38.6	04.4	58 50.6	16.6	114 33.1	113	22 49.3	− 95
9	256 53.5	294 33.4	·· 27.3	283 48.7	·· 11.4	275 40.6	·· 04.2	73 53.1	·· 16.7	129 03.4	114	·22 39.8	− 95
10	271 56.0	309 32.8	26.4	298 49.3	10.7	290 42.5	04.0	88 55.6	16.7	143 33.8	115	22 30.3	− 96
11	286 58.4	324 32.1	25.4	313 49.9	10.0	305 44.5	03.8	103 58.2	16.7	158 04.3	115	22 20.7	− 98
12	302 00.9	339 31.5	−16 24.4	328 50.5	−12 09.3	320 46.4	− 9 03.6	119 00.7	+ 1 16.8	172 34.8	115	+22 10.9	− 99
13	317 03.4	354 30.9	23.4	343 51.1	08.6	335 48.4	03.4	134 03.2	16.8	187 05.3	117	22 01.0	− 99
14	332 05.8	9 30.2	22.5	358 51.7	07.9	350 50.3	03.2	149 05.7	16.8	201 36.0	116	21 51.1	−101
15	347 08.3	24 29.6	·· 21.5	13 52.3	·· 07.1	5 52.3	·· 03.0	164 08.2	·· 16.9	216 06.6	118	·21 41.0	−102
16	2 10.7	39 29.0	20.5	28 52.9	06.4	20 54.2	02.8	179 10.7	16.9	230 37.4	117	21 30.8	−103
17	17 13.2	54 28.3	19.5	43 53.4	05.7	35 56.2	02.6	194 13.2	16.9	245 08.1	119	21 20.5	−104
18	32 15.7	69 27.7	−16 18.5	58 54.0	−12 05.0	50 58.2	− 9 02.4	209 15.7	+ 1 17.0	259 39.0	119	+21 10.1	−105
19	47 18.1	84 27.1	17.6	73 54.6	04.3	66 00.1	02.2	224 18.2	17.0	274 09.9	119	20 59.6	−106
20	62 20.6	99 26.4	16.6	88 55.2	03.6	81 02.1	02.0	239 20.7	17.0	288 40.8	120	20 49.0	−108
21	77 23.1	114 25.8	·· 15.6	103 55.8	·· 02.8	96 04.0	·· 01.7	254 23.2	·· 17.0	303 11.8	121	·20 38.2	−108
22	92 25.5	129 25.2	14.6	118 56.4	02.1	111 06.0	01.5	269 25.7	17.1	317 42.9	121	20 27.4	−109
23	107 28.0	144 24.6	13.6	133 57.0	01.4	126 07.9	01.3	284 28.2	17.1	332 14.0	121	20 16.5	−110
0	122 30.5	159 23.9	−16 12.7	148 57.6	−12 00.7	141 09.9	− 9 01.1	299 30.8	+ 1 17.1	346 45.1	123	+20 05.5	−111
1	137 32.9	174 23.3	11.7	163 58.2	12 00.0	156 11.8	00.9	314 33.3	17.2	1 16.4	122	19 54.4	−113
2	152 35.4	189 22.7	10.7	178 58.8	11 59.2	171 13.8	00.7	329 35.8	17.2	15 47.6	123	19 43.1	−113
3	167 37.9	204 22.1	·· 09.7	193 59.4	·· 58.5	186 15.7	·· 00.5	344 38.3	·· 17.2	30 18.9	124	·19 31.8	−114
4	182 40.3	219 21.4	08.7	209 00.0	57.8	201 17.7	00.3	359 40.8	17.3	44 50.3	125	19 20.4	−115
5	197 42.8	234 20.8	07.7	224 00.5	57.1	216 19.6	9 00.1	14 43.3	17.3	59 21.8	124	19 08.9	−116
6	212 45.2	249 20.2	−16 06.7	239 01.1	−11 56.4	231 21.6	− 8 59.9	29 45.8	+ 1 17.3	73 53.2	126	+18 57.3	−117
7	227 47.7	264 19.6	05.7	254 01.7	55.6	246 23.6	59.7	44 48.3	17.4	88 24.8	125	18 45.6	−118
8	242 50.2	279 18.9	04.8	269 02.3	54.9	261 25.5	59.5	59 50.8	17.4	102 56.3	127	18 33.8	−119
9	257 52.6	294 18.3	·· 03.8	284 02.9	·· 54.2	276 27.5	·· 59.2	74 53.3	·· 17.4	117 28.0	127	·18 21.9	−119
10	272 55.1	309 17.7	02.8	299 03.5	53.5	291 29.4	59.0	89 55.8	17.5	131 59.7	127	18 10.0	−121
11	287 57.6	324 17.1	01.8	314 04.1	52.7	306 31.4	58.8	104 58.4	17.5	146 31.4	128	17 57.9	−121
12	303 00.0	339 16.5	−16 00.8	329 04.7	−11 52.0	321 33.3	− 8 58.6	120 00.9	+ 1 17.5	161 03.2	128	+17 45.8	−123
13	318 02.5	354 15.8	15 59.8	344 05.3	51.3	336 35.3	58.4	135 03.4	17.6	175 35.0	129	17 33.5	−123
14	333 05.0	9 15.2	58.8	359 05.9	50.6	351 37.2	58.2	150 05.9	17.6	190 06.9	130	17 21.2	−124
15	348 07.4	24 14.6	·· 57.8	14 06.5	·· 49.9	6 39.2	·· 58.0	165 08.4	·· 17.6	204 38.9	130	·17 08.8	−125
16	3 09.9	39 14.0	56.8	29 07.1	49.1	21 41.1	57.8	180 10.9	17.7	219 10.9	130	16 56.3	−126
17	18 12.4	54 13.4	55.8	44 07.7	48.4	36 43.1	57.6	195 13.4	17.7	233 42.9	131	16 43.7	−126
18	33 14.8	69 12.8	−15 54.8	59 08.3	−11 47.7	51 45.0	− 8 57.4	210 15.9	+ 1 17.7	248 15.0	131	+16 31.1	−128
19	48 17.3	84 12.1	53.8	74 08.9	47.0	66 47.0	57.2	225 18.4	17.8	262 47.1	132	16 18.3	−128
20	63 19.7	99 11.5	52.8	89 09.5	46.2	81 48.9	57.0	240 21.0	17.8	277 19.3	132	16 05.5	−129
21	78 22.2	114 10.9	·· 51.8	104 10.1	·· 45.5	96 50.9	·· 56.7	255 23.5	·· 17.8	291 51.5	133	·15 52.6	−130
22	93 24.7	129 10.3	50.8	119 10.7	44.8	111 52.8	56.5	270 26.0	17.9	306 23.8	133	15 39.6	−130
23	108 27.1	144 09.7	49.8	134 11.3	44.1	126 54.8	56.3	285 28.5	17.9	320 56.1	133	15 26.6	−132
24	123 29.6	159 09.1	−15 48.8	149 11.9	−11 43.3	141 56.7	− 8 56.1	300 31.0	+ 1 17.9	335 28.4	134	+15 13.4	−132
code	—	− 6	+ 10	+ 6	+ 7	+ 20	+ 2	+ 25	0				

GCT	SUN GHA	SUN Dec.
h	° ′	° ′
0	177 09.4	−19 54.6
1	192 09.3	54.0
2	207 09.1	53.5
3	222 08.9	•• 52.9
4	237 08.7	52.4
5	252 08.6	51.8
6	267 08.4	−19 51.3
7	282 08.2	50.7
8	297 08.0	50.1
9	312 07.9	•• 49.6
10	327 07.7	49.0
11	342 07.5	48.4
12	357 07.4	−19 47.9
13	12 07.2	47.3
14	27 07.0	46.7
15	42 06.8	•• 46.2
16	57 06.7	45.6
17	72 06.5	45.1
18	87 06.3	−19 44.5
19	102 06.2	43.9
20	117 06.0	43.3
21	132 05.8	•• 42.8
22	147 05.7	42.2
23	162 05.5	41.6
0	177 05.3	−19 41.1
1	192 05.2	40.5
2	207 05.0	39.9
3	222 04.8	•• 39.3
4	237 04.7	38.8
5	252 04.5	38.2
6	267 04.3	−19 37.6
7	282 04.2	37.0
8	297 04.0	36.5
9	312 03.8	•• 35.9
10	327 03.7	35.3
11	342 03.5	34.7
12	357 03.4	−19 34.2
13	12 03.2	33.6
14	27 03.0	33.0
15	42 02.9	•• 32.4
16	57 02.7	31.8
17	72 02.6	31.2
18	87 02.4	−19 30.7
19	102 02.2	30.1
20	117 02.1	29.5
21	132 01.9	•• 28.9
22	147 01.7	28.3
23	162 01.6	27.7
0	177 01.4	−19 27.2
1	192 01.3	26.6
2	207 01.1	26.0
3	222 01.0	•• 25.4
4	237 00.8	24.8
5	252 00.6	24.2
6	267 00.5	−19 23.6
7	282 00.3	23.0
8	297 00.2	22.4
9	312 00.0	•• 21.8
10	326 59.9	21.3
11	341 59.7	20.7
12	356 59.6	−19 20.1
13	11 59.4	19.5
14	26 59.2	18.9
15	41 59.1	•• 18.3
16	56 58.9	17.7
17	71 58.8	17.1
18	86 58.6	−19 16.5
19	101 58.5	15.9
20	116 58.3	15.3
21	131 58.2	•• 14.7
22	146 58.0	14.1
23	161 57.9	13.5
24	176 57.7	−19 12.9
code	—	+ 6

No.	STARS SHA	Dec.	Transit Mer. Gr.
	° ′	° ′	h m
1	358 32.4	+28 49.3	15 57
2	358 22.2	+58 53.0	15 58
3	349 43.0	−18 15.4	16 32
4	339 21.4	+59 59.2	17 14
5	336 01.4	−57 29.3	17 27
6	332 45.5	+89 02.5	17 40
7	328 53.9	+23 14.1	17 55
8	315 53.7	−40 30.1	18 47
9	309 47.6	+49 41.6	19 12
10	291 43.1	+16 24.9	20 24
11	281 56.9	− 8 15.4	21 03
12	281 43.6	+45 57.3	21 04
13	279 22.1	+ 6 18.5	21 13
14	279 11.7	+28 34.3	21 14
15	276 33.8	− 1 13.8	21 24
16	271 51.8	+ 7 24.1	21 43
17	264 16.5	−52 40.1	22 13
18	259 14.8	−16 38.8	22 33
19	255 49.1	−28 54.2	22 47
20	245 48.5	+ 5 21.2	23 27
21	244 24.7	+28 08.8	23 32
22	234 36.8	−59 21.0	0 15
23	223 26.7	−43 14.0	1 00
24	221 49.3	−69 30.8	1 06
25	218 41.9	− 8 26.7	1 19
26	208 33.1	+12 12.4	1 59
27	194 48.3	+62 00.7	2 54
28	183 21.3	+14 50.6	3 40
29	174 01.9	−62 49.5	4 17
30	172 53.4	−56 50.2	4 22
31	168 47.3	−59 25.1	4 38
32	167 01.3	+56 13.1	4 45
33	159 30.3	+55 10.4	5 15
34	159 20.7	−10 54.5	5 16
35	153 35.6	+49 33.0	5 39
36	149 03.1	−36 07.8	5 57
37	146 38.5	+19 25.9	6 06
38	140 56.3	−60 38.0	6 29
39	137 17.5	+74 20.9	6 44
40	126 50.8	+26 52.4	7 25
41	120 38.6	−22 29.1	7 50
42	113 24.1	−26 19.6	8 19
43	109 08.7	−68 56.4	8 36
44	103 06.7	−15 40.1	9 00
45	97 26.0	−37 04.3	9 23
46	96 50.3	+12 35.4	9 25
47	91 08.4	+51 29.3	9 48
48	84 46.4	−34 24.7	10 13
49	81 11.2	+38 43.9	10 27
50	76 56.8	−26 21.7	10 44
51	62 54.4	+ 8 44.1	11 40
52	54 33.6	−56 53.8	12 14
53	50 04.1	+45 06.2	12 32
54	34 33.6	+ 9 38.9	13 33
55	28 42.8	−47 12.2	13 57
56	16 15.9	−29 53.1	14 46
57	14 25.4	+14 56.5	14 54

Lat.	Sunrise	Twlt. begins	Moonrise 22	23	24	25
N °	h m	h m	h m	h m	h m	h m
70	10 46	6 18	□	□	15 36	18 02
68	10 00	6 15	□	□	16 10	18 18
66	9 30	6 12	□	14 21	16 35	18 30
64	9 07	6 09	12 36	14 59	16 54	18 40
62	8 50	6 06	13 35	15 25	17 09	18 49
60	8 35	6 04	14 08	15 46	17 22	18 56
58	8 22	6 01	14 32	16 02	17 33	19 02
56	8 12	5 59	14 51	16 17	17 43	19 08
54	8 02	5 57	15 08	16 29	17 51	19 13
52	7 54	5 55	15 22	16 39	17 59	19 18
50	7 46	5 53	15 34	16 49	18 05	19 22
45	7 30	5 48	15 59	17 09	18 20	19 31
40	7 16	5 42	16 19	17 25	18 31	19 38
35	7 05	5 37	16 35	17 38	18 41	19 44
30	6 55	5 32	16 50	17 50	18 50	19 50
20	6 38	5 21	17 14	18 10	19 05	19 59
10	6 23	5 08	17 35	18 27	19 18	20 08
0	6 08	4 55	17 54	18 43	19 30	20 15
10	5 54	4 38	18 13	18 59	19 42	20 23
20	5 38	4 16	18 34	19 17	19 55	20 31
30	5 20	3 48	18 58	19 36	20 10	20 41
35	5 09	3 28	19 12	19 47	20 18	20 46
40	4 57	3 04	19 28	20 00	20 28	20 52
45	4 43	2 30	19 47	20 16	20 39	20 59
50	4 25	1 33	20 11	20 34	20 53	21 07
52	4 17	0 43	20 22	20 43	20 59	21 11
54	4 07	////	20 35	20 53	21 06	21 16
56	3 57	////	20 50	21 04	21 13	21 20
58	3 44	////	21 08	21 17	21 22	21 25
60	3 30	////	21 29	21 31	21 32	21 31
S						

Lat.	Sunset	Twlt. ends	Moonset 22	23	24	25
N °	h m	h m	h m	h m	h m	h m
70	13 39	18 09	□	□	11 22	10 31
68	14 25	18 12	□	□	10 46	10 14
66	14 55	18 15	□	10 55	10 20	10 00
64	15 17	18 17	10 55	10 16	10 00	9 48
62	15 35	18 20	9 56	9 49	9 43	9 38
60	15 49	18 21	9 23	9 28	9 29	9 29
58	16 02	18 24	8 58	9 10	9 18	9 22
56	16 13	18 26	8 38	8 56	9 07	9 15
54	16 22	18 28	8 21	8 43	8 58	9 09
52	16 31	18 31	8 07	8 32	8 50	9 04
50	16 38	18 32	7 55	8 22	8 42	8 59
45	16 54	18 37	7 29	8 01	8 26	8 48
40	17 08	18 42	7 08	7 43	8 13	8 39
35	17 19	18 47	6 51	7 29	8 02	8 31
30	17 29	18 52	6 36	7 16	7 52	8 24
20	17 46	19 03	6 10	6 55	7 35	8 13
10	18 01	19 14	5 48	6 36	7 20	8 02
0	18 15	19 28	5 28	6 18	7 06	7 52
10	18 30	19 45	5 07	6 00	6 52	7 42
20	18 45	20 06	4 45	5 41	6 37	7 31
30	19 03	20 34	4 19	5 19	6 19	7 19
35	19 13	20 53	4 03	5 05	6 09	7 12
40	19 25	21 17	3 45	4 50	5 57	7 03
45	19 40	21 51	3 24	4 32	5 43	6 54
50	19 57	22 45	2 56	4 09	5 25	6 42
52	20 06	23 31	2 43	3 58	5 17	6 36
54	20 15	////	2 27	3 46	5 08	6 30
56	20 26	////	2 09	3 31	4 58	6 23
58	20 38	////	1 46	3 14	4 46	6 16
60	20 52	////	1 16	2 54	4 32	6 07
S						

GCT	Equation of Time (App.—Mean) 22	23	24
h	m s	m s	m s
0	−11 22.0	−11 38.4	−11 54.0
6	−11 26.1	−11 42.3	−11 57.8
12	−11 30.2	−11 46.3	−12 01.5
18	−11 34.3	−11 50.1	−12 05.2
24	−11 38.4	−11 54.0	−12 08.8

DAY	GCT of Transit Meridian of Greenwich: Moon	Venus	Mars	Jupiter	Saturn
	h m	h m	h m	h m	h m
22	24 06	13 21	14 06	14 40	4 09
23	0 06	13 22	14 05	14 37	4 05
24	0 55	13 23	14 04	14 33	4 01
25	1 41	13 24	14 03	14 30	3 57

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb	Venus	Mars
°	′	′	′
0	0.6	0.1	0.1
30	0.6	0.1	0.1
45	0.6	0.1	0.0
60	0.6	0.0	0.0
75	0.6	0.0	0.0
90			

Moon's Lower Limb
Add

Alt.	22	23	24
°	′	′	′
0	12.9	13.5	14.0
4	12.9	13.5	14.0
8	12.9	13.5	14.0
12	12.9	13.6	14.1
16	13.0	13.6	14.1
20	13.0	13.6	14.1
24	13.1	13.7	14.1
28	13.2	13.7	14.2
32	13.2	13.8	14.2
36	13.3	13.9	14.3
40	13.4	13.9	14.3
44	13.5	14.0	14.4
48	13.6	14.1	14.5
52	13.7	14.2	14.5
56	13.9	14.3	14.6
60	14.0	14.4	14.7
64	14.1	14.5	14.7
68	14.3	14.6	14.8
72	14.4	14.7	14.9
76	14.5	14.8	15.0
80	14.7	14.9	15.1
84	14.8	15.0	15.1
88	14.9	15.1	15.2
90			

Add to table, back cover

Moon's Upper Limb
Subtract

Alt.	22	23	24
°	′	′	′
0	17.1	16.7	16.4
4	17.1	16.7	16.4
8	17.0	16.7	16.4
12	17.0	16.7	16.4
16	17.0	16.6	16.4
20	16.9	16.6	16.3
24	16.9	16.6	16.3
28	16.8	16.5	16.3
32	16.7	16.4	16.2
36	16.6	16.4	16.2
40	16.5	16.3	16.1
44	16.4	16.2	16.1
48	16.3	16.1	16.0
52	16.2	16.1	15.9
56	16.1	16.0	15.9
60	16.0	15.9	15.8
64	15.8	15.8	15.7
68	15.7	15.7	15.6
72	15.6	15.6	15.6
76	15.4	15.4	15.5
80	15.3	15.3	15.4
84	15.1	15.2	15.3
88	15.0	15.1	15.2
90			

Subtract from table, back cover

Full Moon 23

GCT	♈ GHA	VENUS −3.3 GHA	VENUS Dec.	MARS 1.4 GHA	MARS Dec.	JUPITER −1.6 GHA	JUPITER Dec.	SATURN 1.0 GHA	SATURN Dec.	MOON GHA	code	MOON Dec.	code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
0	123 29.6	159 09.1	−15 48.8	149 11.9	−11 43.3	141 56.7	− 8 56.1	300 31.0	+ 1 17.9	335 28.4	134	+15 13.4	−132
1	138 32.1	174 08.5	47.8	164 12.4	42.6	156 58.7	55.9	315 33.5	18.0	350 00.8	135	15 00.2	−133
2	153 34.5	189 07.9	46.8	179 13.0	41.9	172 00.6	55.7	330 36.0	18.0	4 33.3	134	14 46.9	−133
3	168 37.0	204 07.2	·· 45.8	194 13.6	·· 41.2	187 02.6	·· 55.5	345 38.5	·· 18.0	19 05.7	136	· 14 33.6	−135
4	183 39.5	219 06.6	44.8	209 14.2	40.4	202 04.5	55.3	0 41.1	18.1	33 38.3	135	14 20.1	−135
5	198 41.9	234 06.0	43.8	224 14.8	39.7	217 06.5	55.1	15 43.6	18.1	48 10.8	136	14 06.6	−135
6	213 44.4	249 05.4	−15 42.8	239 15.4	−11 39.0	232 08.4	− 8 54.9	30 46.1	+ 1 18.1	62 43.4	137	+13 53.1	−137
7	228 46.8	264 04.8	41.8	254 16.0	38.3	247 10.4	54.7	45 48.6	18.2	77 16.1	137	13 39.4	−137
8	243 49.3	279 04.2	40.8	269 16.6	37.5	262 12.3	54.4	60 51.1	18.2	91 48.8	137	13 25.7	−137
9	258 51.8	294 03.6	·· 39.7	284 17.2	·· 36.8	277 14.3	·· 54.2	75 53.6	·· 18.2	106 21.5	138	· 13 12.0	−139
10	273 54.2	309 03.0	38.7	299 17.8	36.1	292 16.2	54.0	90 56.1	18.3	120 54.3	138	12 58.1	−139
11	288 56.7	324 02.4	37.7	314 18.4	35.4	307 18.2	53.8	105 58.7	18.3	135 27.1	138	12 44.2	−140
12	303 59.2	339 01.8	−15 36.7	329 19.0	−11 34.6	322 20.1	− 8 53.6	121 01.2	+ 1 18.3	149 59.9	138	+12 30.2	−140
13	319 01.6	354 01.2	35.7	344 19.6	33.9	337 22.1	53.4	136 03.7	18.4	164 32.7	139	12 16.2	−141
14	334 04.1	9 00.6	34.7	359 20.2	33.2	352 24.0	53.2	151 06.2	18.4	179 05.6	140	12 02.1	−142
15	349 06.6	24 00.0	·· 33.7	14 20.8	·· 32.5	7 26.0	·· 53.0	166 08.7	·· 18.4	193 38.6	139	· 11 47.9	−142
16	4 09.0	38 59.3	32.7	29 21.4	31.7	22 27.9	52.8	181 11.2	18.5	208 11.5	140	11 33.7	−143
17	19 11.5	53 58.7	31.6	44 22.0	31.0	37 29.9	52.6	196 13.7	18.5	222 44.5	141	11 19.4	−143
18	34 14.0	68 58.1	−15 30.6	59 22.6	−11 30.3	52 31.8	− 8 52.3	211 16.3	+ 1 18.5	237 17.6	140	+11 05.1	−144
19	49 16.4	83 57.5	29.6	74 23.2	29.5	67 33.8	52.1	226 18.8	18.6	251 50.6	141	10 50.7	−144
20	64 18.9	98 56.9	28.6	89 23.8	28.8	82 35.7	51.9	241 21.3	18.6	266 23.7	141	10 36.3	−145
21	79 21.3	113 56.3	·· 27.6	104 24.4	·· 28.1	97 37.7	·· 51.7	256 23.8	·· 18.6	280 56.8	141	· 10 21.8	−146
22	94 23.8	128 55.7	26.6	119 25.0	27.4	112 39.6	51.5	271 26.3	18.7	295 29.9	142	10 07.2	−146
23	109 26.3	143 55.1	25.5	134 25.6	26.6	127 41.6	51.3	286 28.8	18.7	310 03.1	142	9 52.6	−147
0	124 28.7	158 54.5	−15 24.5	149 26.2	−11 25.9	142 43.5	− 8 51.1	301 31.4	+ 1 18.7	324 36.3	142	+ 9 37.9	−147
1	139 31.2	173 53.9	23.5	164 26.8	25.2	157 45.5	50.9	316 33.9	18.8	339 09.5	142	9 23.2	−147
2	154 33.7	188 53.3	22.5	179 27.4	24.4	172 47.4	50.7	331 36.4	18.8	353 42.7	143	9 08.5	−149
3	169 36.1	203 52.7	·· 21.5	194 28.0	·· 23.7	187 49.4	·· 50.5	346 38.9	·· 18.8	8 16.0	143	· 8 53.6	−148
4	184 38.6	218 52.1	20.4	209 28.6	23.0	202 51.3	50.2	1 41.4	18.9	22 49.3	143	8 38.8	−149
5	199 41.1	233 51.5	19.4	224 29.2	22.3	217 53.3	50.0	16 43.9	18.9	37 22.6	143	8 23.9	−150
6	214 43.5	248 50.9	−15 18.4	239 29.8	−11 21.5	232 55.2	− 8 49.8	31 46.5	+ 1 19.0	51 55.9	143	+ 8 08.9	−150
7	229 46.0	263 50.4	17.4	254 30.4	20.8	247 57.2	49.6	46 49.0	19.0	66 29.2	144	7 53.9	−150
8	244 48.5	278 49.8	16.3	269 31.0	20.1	262 59.1	49.4	61 51.5	19.0	81 02.6	143	7 38.9	−151
9	259 50.9	293 49.2	·· 15.3	284 31.6	·· 19.3	278 01.1	·· 49.2	76 54.0	·· 19.1	95 35.9	144	· 7 23.8	−151
10	274 53.4	308 48.6	14.3	299 32.2	18.6	293 03.0	49.0	91 56.5	19.1	110 09.3	144	7 08.7	−152
11	289 55.8	323 48.0	13.3	314 32.8	17.9	308 05.0	48.8	106 59.1	19.1	124 42.7	144	6 53.5	−152
12	304 58.3	338 47.4	−15 12.2	329 33.4	−11 17.1	323 06.9	− 8 48.6	122 01.6	+ 1 19.2	139 16.1	144	+ 6 38.3	−152
13	320 00.8	353 46.8	11.2	344 34.0	16.4	338 08.9	48.3	137 04.1	19.2	153 49.5	144	6 23.1	−153
14	335 03.2	8 46.2	10.2	359 34.6	15.7	353 10.8	48.1	152 06.6	19.2	168 22.9	145	6 07.8	−153
15	350 05.7	23 45.6	·· 09.1	14 35.2	·· 14.9	8 12.8	·· 47.9	167 09.1	·· 19.3	182 56.4	144	· 5 52.5	−154
16	5 08.2	38 45.0	08.1	29 35.8	14.2	23 14.7	47.7	182 11.6	19.3	197 29.8	145	5 37.1	−154
17	20 10.6	53 44.4	07.1	44 36.5	13.5	38 16.7	47.5	197 14.2	19.3	212 03.3	144	5 21.7	−154
18	35 13.1	68 43.8	−15 06.0	59 37.1	−11 12.8	53 18.6	− 8 47.3	212 16.7	+ 1 19.4	226 36.7	145	+ 5 06.3	−154
19	50 15.6	83 43.2	05.0	74 37.7	12.0	68 20.5	47.1	227 19.2	19.4	241 10.2	144	4 50.9	−155
20	65 18.0	98 42.7	04.0	89 38.3	11.3	83 22.5	46.9	242 21.7	19.5	255 43.6	145	4 35.4	−155
21	80 20.5	113 42.1	·· 02.9	104 38.9	·· 10.6	98 24.4	·· 46.7	257 24.2	·· 19.5	270 17.1	145	· 4 19.9	−156
22	95 22.9	128 41.5	01.9	119 39.5	09.8	113 26.4	46.4	272 26.8	19.5	284 50.6	144	4 04.3	−155
23	110 25.4	143 40.9	15 00.9	134 40.1	09.1	128 28.3	46.2	287 29.3	19.6	299 24.0	145	3 48.8	−156
0	125 27.9	158 40.3	−14 59.8	149 40.7	−11 08.4	143 30.3	− 8 46.0	302 31.8	+ 1 19.6	313 57.5	145	+ 3 33.2	−156
1	140 30.3	173 39.7	58.8	164 41.3	07.6	158 32.2	45.8	317 34.3	19.6	328 31.0	144	3 17.6	−157
2	155 32.8	188 39.1	57.7	179 41.9	06.9	173 34.2	45.6	332 36.8	19.7	343 04.4	145	3 01.9	−157
3	170 35.3	203 38.5	·· 56.7	194 42.5	·· 06.2	188 36.1	·· 45.4	347 39.4	·· 19.7	357 37.9	144	· 2 46.2	−156
4	185 37.7	218 38.0	55.7	209 43.1	05.4	203 38.1	45.2	2 41.9	19.7	12 11.3	145	2 30.6	−158
5	200 40.2	233 37.4	54.6	224 43.7	04.7	218 40.0	45.0	17 44.4	19.8	26 44.8	144	2 14.8	−157
6	215 42.7	248 36.8	−14 53.6	239 44.3	−11 04.0	233 42.0	− 8 44.8	32 46.9	+ 1 19.8	41 18.2	144	+ 1 59.1	−157
7	230 45.1	263 36.2	52.5	254 44.9	03.2	248 43.9	44.5	47 49.5	19.9	55 51.6	144	1 43.4	−158
8	245 47.6	278 35.6	51.5	269 45.5	02.5	263 45.9	44.3	62 52.0	19.9	70 25.0	144	1 27.6	−158
9	260 50.1	293 35.0	·· 50.5	284 46.1	·· 01.7	278 47.8	·· 44.1	77 54.5	·· 19.9	84 58.4	144	· 1 11.8	−158
10	275 52.5	308 34.5	49.4	299 46.7	01.0	293 49.7	43.9	92 57.0	20.0	99 31.8	144	0 56.0	−158
11	290 55.0	323 33.9	48.4	314 47.3	11 00.3	308 51.7	43.7	107 59.5	20.0	114 05.2	144	0 40.2	−158
12	305 57.4	338 33.3	−14 47.3	329 47.9	−10 59.5	323 53.6	− 8 43.5	123 02.1	+ 1 20.0	128 38.6	143	+ 0 24.4	−159
13	320 59.9	353 32.7	46.3	344 48.6	58.8	338 55.6	43.3	138 04.6	20.1	143 11.9	143	+ 0 08.5	−158
14	336 02.4	8 32.1	45.2	359 49.2	58.1	353 57.5	43.1	153 07.1	20.1	157 45.2	143	− 0 07.3	−159
15	351 04.8	23 31.6	·· 44.2	14 49.8	·· 57.3	8 59.5	·· 42.8	168 09.6	·· 20.2	172 18.5	143	· 0 23.2	−158
16	6 07.3	38 31.0	43.1	29 50.4	56.6	24 01.4	42.6	183 12.2	20.2	186 51.8	143	0 39.0	−159
17	21 09.8	53 30.4	42.1	44 51.0	55.9	39 03.4	42.4	198 14.7	20.2	201 25.1	142	0 54.9	−159
18	36 12.2	68 29.8	−14 41.0	59 51.6	−10 55.1	54 05.3	− 8 42.2	213 17.2	+ 1 20.3	215 58.3	142	− 1 10.8	−159
19	51 14.7	83 29.3	40.0	74 52.2	54.4	69 07.3	42.0	228 19.7	20.3	230 31.5	142	1 26.7	−159
20	66 17.2	98 28.7	38.9	89 52.8	53.7	84 09.2	41.8	243 22.2	20.3	245 04.7	141	1 42.6	−159
21	81 19.6	113 28.1	·· 37.9	104 53.4	·· 52.9	99 11.1	·· 41.6	258 24.8	·· 20.4	259 37.8	142	· 1 58.5	−159
22	96 22.1	128 27.5	36.8	119 54.0	52.2	114 13.1	41.4	273 27.3	20.4	274 11.0	141	2 14.4	−159
23	111 24.6	143 27.0	35.8	134 54.6	51.4	129 15.0	41.1	288 29.8	20.5	288 44.1	140	2 30.3	−159
24	126 27.0	158 26.4	−14 34.7	149 55.2	−10 50.7	144 17.0	− 8 40.9	303 32.3	+ 1 20.5	303 17.1	140	− 2 46.2	−159
code	—	− 6	+ 10	+ 6	+ 7	+ 20	+ 3	+ 25	0				

GCT	SUN GHA	SUN Dec.
h	° ′	° ′
0	176 57.7	−19 12.9
1	191 57.6	12.3
2	206 57.4	11.7
3	221 57.3	•• 11.1
4	236 57.1	10.5
5	251 57.0	09.9
6	266 56.8	−19 09.3
7	281 56.7	08.7
8	296 56.5	08.1
9	311 56.4	•• 07.4
10	326 56.2	06.8
11	341 56.1	06.2
12	356 55.9	−19 05.6
13	11 55.8	05.0
14	26 55.7	04.4
15	41 55.5	•• 03.8
16	56 55.4	03.2
17	71 55.2	02.6
18	86 55.1	−19 02.0
19	101 54.9	01.3
20	116 54.8	00.7
21	131 54.6	·19 00.1
22	146 54.5	18 59.5
23	161 54.4	58.9
0	176 54.2	−18 58.3
1	191 54.1	57.7
2	206 53.9	57.0
3	221 53.8	•• 56.4
4	236 53.6	55.8
5	251 53.5	55.2
6	266 53.4	−18 54.6
7	281 53.2	53.9
8	296 53.1	53.3
9	311 52.9	•• 52.7
10	326 52.8	52.1
11	341 52.7	51.4
12	356 52.5	−18 50.8
13	11 52.4	50.2
14	26 52.3	49.6
15	41 52.1	•• 49.0
16	56 52.0	48.3
17	71 51.8	47.7
18	86 51.7	−18 47.1
19	101 51.6	46.4
20	116 51.4	45.8
21	131 51.3	•• 45.2
22	146 51.2	44.6
23	161 51.0	43.9
0	176 50.9	−18 43.3
1	191 50.8	42.7
2	206 50.6	42.0
3	221 50.5	•• 41.4
4	236 50.4	40.8
5	251 50.2	40.1
6	266 50.1	−18 39.5
7	281 50.0	38.9
8	296 49.8	38.2
9	311 49.7	•• 37.6
10	326 49.6	37.0
11	341 49.4	36.3
12	356 49.3	−18 35.7
13	11 49.2	35.1
14	26 49.1	34.4
15	41 48.9	•• 33.8
16	56 48.8	33.1
17	71 48.7	32.5
18	86 48.5	−18 31.9
19	101 48.4	31.2
20	116 48.3	30.6
21	131 48.2	•• 29.9
22	146 48.0	29.3
23	161 47.9	28.6
24	176 47.8	−18 28.0
code	−	+ 6

No.	STARS SHA	STARS Dec.	Transit Mer. Gr.
	° ′	° ′	h m
1	358 32.4	+28 49.3	15 45
2	358 22.2	+58 53.0	15 46
3	349 43.0	−18 15.4	16 21
4	339 21.4	+59 59.2	17 02
5	336 01.4	−57 29.3	17 15
6	332 46.5	+89 02.5	17 28
7	328 53.9	+23 14.1	17 44
8	315 53.7	−40 30.1	18 35
9	309 47.6	+49 41.6	19 00
10	291 43.1	+16 24.9	20 12
11	281 56.9	− 8 15.4	20 51
12	281 43.6	+45 57.3	20 52
13	279 22.1	+ 6 18.5	21 01
14	279 11.7	+28 34.3	21 02
15	276 33.8	− 1 13.8	21 12
16	271 51.8	+ 7 24.1	21 31
17	264 16.5	−52 40.1	22 01
18	259 14.8	−16 38.8	22 21
19	255 49.1	−28 54.2	22 35
20	245 48.5	+ 5 21.1	23 15
21	244 24.7	+28 08.8	23 21
22	234 36.8	−59 21.0	0 04
23	223 26.7	−43 14.0	0 48
24	221 49.3	−69 30.8	0 55
25	218 41.9	− 8 26.7	1 07
26	208 33.1	+12 12.4	1 48
27	194 48.3	+62 00.7	2 42
28	183 21.2	+14 50.6	3 28
29	174 01.9	−62 49.5	4 05
30	172 53.3	−56 50.2	4 10
31	168 47.2	−59 25.1	4 26
32	167 01.3	+56 13.1	4 33
33	159 30.3	+55 10.4	5 03
34	159 20.7	−10 54.5	5 04
35	153 35.5	+49 33.0	5 27
36	149 03.1	−36 07.8	5 45
37	146 38.5	+19 25.9	5 55
38	140 56.3	−60 38.0	6 17
39	137 17.4	+74 20.9	6 32
40	126 50.8	+26 52.4	7 14
41	120 38.6	−22 29.1	7 38
42	113 24.1	−26 19.6	8 07
43	109 08.6	−68 56.4	8 24
44	103 06.6	−15 40.1	8 48
45	97 26.0	−37 04.3	9 11
46	96 50.3	+12 35.4	9 13
47	91 08.4	+51 29.3	9 36
48	84 46.4	−34 24.7	10 01
49	81 11.2	+38 43.9	10 16
50	76 56.8	−26 21.7	10 33
51	62 54.4	+ 8 44.1	11 29
52	54 33.6	−56 53.8	12 02
53	50 04.1	+45 06.2	12 20
54	34 33.6	+ 9 38.9	13 22
55	28 42.8	−47 12.1	13 45
56	16 15.9	−29 53.1	14 35
57	14 25.4	+14 56.5	14 42

Lat.	Sunrise	Twlt. begins	Moonrise 25	26	27	28
N °	h m	h m	h m	h m	h m	h m
70	10 25	6 11	18 02	20 08	22 10	24 19
68	9 46	6 09	18 18	20 14	22 07	24 06
66	9 20	6 06	18 30	20 18	22 05	23 56
64	8 59	6 04	18 40	20 22	22 03	23 48
62	8 43	6 02	18 49	20 25	22 01	23 41
60	8 29	6 00	18 56	20 28	22 00	23 35
58	8 17	5 58	19 02	20 30	21 59	23 29
56	8 07	5 56	19 08	20 33	21 57	23 25
54	7 58	5 54	19 13	20 34	21 56	23 20
52	7 50	5 52	19 18	20 36	21 55	23 17
50	7 43	5 50	19 22	20 38	21 55	23 13
45	7 27	5 46	19 31	20 41	21 53	23 06
40	7 14	5 41	19 38	20 44	21 51	23 00
35	7 03	5 36	19 44	20 47	21 50	22 54
30	6 54	5 31	19 50	20 49	21 49	22 50
20	6 37	5 21	19 59	20 53	21 47	22 42
10	6 23	5 10	20 08	20 56	21 45	22 35
0	6 09	4 56	20 15	20 59	21 43	22 29
10	5 55	4 40	20 23	21 02	21 42	22 22
20	5 40	4 19	20 31	21 06	21 40	22 16
30	5 23	3 51	20 41	21 10	21 38	22 08
35	5 13	3 32	20 46	21 12	21 37	22 04
40	5 01	3 09	20 52	21 14	21 36	21 59
45	4 47	2 37	20 59	21 17	21 35	21 53
50	4 30	1 44	21 07	21 20	21 33	21 47
52	4 22	1 06	21 11	21 22	21 32	21 43
54	4 13	////	21 16	21 24	21 32	21 40
56	4 03	////	21 20	21 26	21 31	21 36
58	3 52	////	21 25	21 28	21 30	21 32
60	3 38	////	21 31	21 30	21 29	21 28
S						

Lat.	Sunset	Twlt. ends	Moonset 25	26	27	28
N °	h m	h m	h m	h m	h m	h m
70	14 01	18 18	10 31	9 58	9 31	9 04
68	14 40	18 20	10 14	9 50	9 30	9 10
66	15 06	18 21	10 00	9 44	9 29	9 15
64	15 27	18 24	9 48	9 38	9 29	9 19
62	15 43	18 25	9 38	9 33	9 28	9 23
60	15 57	18 28	9 29	9 29	9 27	9 26
58	16 09	18 30	9 22	9 25	9 27	9 29
56	16 19	18 31	9 15	9 21	9 26	9 32
54	16 28	18 33	9 09	9 18	9 26	9 34
52	16 36	18 35	9 04	9 15	9 26	9 36
50	16 43	18 36	8 59	9 13	9 25	9 38
45	16 58	18 40	8 48	9 07	9 25	9 42
40	17 11	18 45	8 39	9 02	9 24	9 46
35	17 22	18 50	8 31	8 58	9 23	9 49
30	17 32	18 55	8 24	8 54	9 23	9 52
20	17 48	19 04	8 13	8 48	9 22	9 56
10	18 02	19 15	8 02	8 42	9 21	10 01
0	18 16	19 29	7 52	8 36	9 20	10 05
10	18 30	19 45	7 42	8 31	9 19	10 09
20	18 45	20 05	7 31	8 25	9 18	10 13
30	19 02	20 32	7 19	8 18	9 17	10 18
35	19 12	20 50	7 12	8 14	9 17	10 20
40	19 23	21 13	7 03	8 10	9 16	10 24
45	19 37	21 45	6 54	8 05	9 15	10 27
50	19 54	22 35	6 42	7 58	9 14	10 32
52	20 02	23 10	6 36	7 55	9 14	10 34
54	20 10	////	6 30	7 52	9 13	10 36
56	20 20	////	6 23	7 48	9 13	10 38
58	20 32	////	6 16	7 44	9 12	10 41
60	20 45	////	6 07	7 40	9 11	10 44
S						

GCT	Equation of Time (App.—Mean) 25	26	27
h	m s	m s	m s
0	−12 08.8	−12 22.9	−12 36.2
6	−12 12.4	−12 26.3	−12 39.3
12	−12 15.9	−12 29.6	−12 42.5
18	−12 19.4	−12 32.9	−12 45.6
24	−12 22.9	−12 36.2	−12 48.6

GCT of Transit Meridian of Greenwich

DAY	Moon	Venus	Mars	Jupiter	Saturn
	h m	h m	h m	h m	h m
25	1 41	13 24	14 03	14 30	3 57
26	2 26	13 25	14 02	14 27	3 53
27	3 10	13 26	14 01	14 24	3 49
28	3 54	13 27	14 00	14 21	3 45

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb	Venus	Mars
°	′	′	′
0			
	0.6	0.1	0.1
30			
	0.6	0.1	0.1
45			
	0.6	0.1	0.0
60			
	0.6	0.0	0.0
75			
	0.6	0.0	0.0
90			

Moon's Lower Limb
Add

Alt.	25	26	27
°	′	′	′
0			
	14.7	15.3	15.9
4			
	14.7	15.3	15.9
8			
	14.7	15.3	15.9
12			
	14.7	15.3	15.9
16			
	14.7	15.3	15.9
20			
	14.7	15.3	15.9
24			
	14.7	15.3	15.9
28			
	14.8	15.3	15.9
32			
	14.8	15.3	15.9
36			
	14.8	15.3	15.9
40			
	14.8	15.3	15.9
44			
	14.9	15.4	15.8
48			
	14.9	15.4	15.8
52			
	14.9	15.4	15.8
56			
	15.0	15.4	15.8
60			
	15.0	15.4	15.8
64			
	15.1	15.4	15.8
68			
	15.1	15.4	15.7
72			
	15.2	15.4	15.7
76			
	15.2	15.5	15.7
80			
	15.3	15.5	15.7
84			
	15.3	15.5	15.7
88			
	15.3	15.5	15.6
90			

Add to table, back cover

Moon's Upper Limb
Subtract

Alt.	25	26	27
°	′	′	′
0			
	16.1	15.7	15.3
4			
	16.1	15.7	15.3
8			
	16.0	15.7	15.3
12			
	16.0	15.7	15.3
16			
	16.0	15.7	15.3
20			
	16.0	15.7	15.4
24			
	16.0	15.7	15.4
28			
	16.0	15.7	15.4
32			
	15.9	15.7	15.4
36			
	15.9	15.7	15.4
40			
	15.9	15.6	15.4
44			
	15.8	15.6	15.4
48			
	15.8	15.6	15.4
52			
	15.8	15.6	15.5
56			
	15.7	15.6	15.5
60			
	15.7	15.6	15.5
64			
	15.6	15.6	15.5
68			
	15.6	15.6	15.5
72			
	15.6	15.6	15.5
76			
	15.5	15.5	15.6
80			
	15.5	15.5	15.6
84			
	15.4	15.5	15.6
88			
	15.4	15.5	15.6
90			

Subtract from table, back cover

GCT	♈ GHA	VENUS −3.3 GHA	VENUS Dec.	MARS 1.4 GHA	MARS Dec.	JUPITER −1.6 GHA	JUPITER Dec.	SATURN 0.9 GHA	SATURN Dec.	MOON GHA	code	MOON Dec.	code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
0	126 27.0	158 26.4	−14 34.7	149 55.2	−10 50.7	144 17.0	− 8 40.9	303 32.3	+ 1 20.5	303 17.1	140	− 2 46.2	−159
1	141 29.5	173 25.8	33.7	164 55.8	50.0	159 18.9	40.7	318 34.9	20.5	317 50.1	140	3 02.1	−159
2	156 31.9	188 25.2	32.6	179 56.5	49.2	174 20.9	40.5	333 37.4	20.6	332 23.1	140	3 18.0	−159
3	171 34.4	203 24.7	·· 31.5	194 57.1	·· 48.5	189 22.8	·· 40.3	348 39.9	·· 20.6	346 56.1	139	· 3 33.9	−159
4	186 36.9	218 24.1	30.5	209 57.7	47.8	204 24.8	40.1	3 42.4	20.6	1 29.0	139	3 49.8	−159
5	201 39.3	233 23.5	29.4	224 58.3	47.0	219 26.7	39.9	18 45.0	20.7	16 01.9	139	4 05.7	−158
6	216 41.8	248 23.0	−14 28.4	239 58.9	−10 46.3	234 28.6	− 8 39.7	33 47.5	+ 1 20.7	30 34.8	138	− 4 21.5	−159
7	231 44.3	263 22.4	27.3	254 59.5	45.5	249 30.6	39.4	48 50.0	20.8	45 07.6	137	4 37.4	−159
8	246 46.7	278 21.8	26.3	270 00.1	44.8	264 32.5	39.2	63 52.5	20.8	59 40.3	138	4 53.3	−158
9	261 49.2	293 21.2	·· 25.2	285 00.7	·· 44.1	279 34.5	·· 39.0	78 55.1	·· 20.8	74 13.1	136	· 5 09.1	−158
10	276 51.7	308 20.7	24.1	300 01.3	43.3	294 36.4	38.8	93 57.6	20.9	88 45.7	137	5 24.9	−159
11	291 54.1	323 20.1	23.1	315 01.9	42.6	309 38.4	38.6	109 00.1	20.9	103 18.4	136	5 40.8	−158
12	306 56.6	338 19.5	−14 22.0	330 02.6	−10 41.9	324 40.3	− 8 38.4	124 02.6	+ 1 21.0	117 51.0	135	− 5 56.6	−158
13	321 59.0	353 19.0	20.9	345 03.2	41.1	339 42.2	38.2	139 05.2	21.0	132 23.5	135	6 12.4	−157
14	337 01.5	8 18.4	19.9	0 03.8	40.4	354 44.2	38.0	154 07.7	21.0	146 56.0	134	6 28.1	−158
15	352 04.0	23 17.8	·· 18.8	15 04.4	·· 39.6	9 46.1	·· 37.7	169 10.2	·· 21.1	161 28.4	134	· 6 43.9	−157
16	7 06.4	38 17.3	17.8	30 05.0	38.9	24 48.1	37.5	184 12.8	21.1	176 00.8	133	6 59.6	−157
17	22 08.9	53 16.7	16.7	45 05.6	38.2	39 50.0	37.3	199 15.3	21.2	190 33.1	133	7 15.3	−157
18	37 11.4	68 16.1	−14 15.6	60 06.2	−10 37.4	54 52.0	− 8 37.1	214 17.8	+ 1 21.2	205 05.4	132	− 7 31.0	−157
19	52 13.8	83 15.6	14.6	75 06.8	36.7	69 53.9	36.9	229 20.3	21.2	219 37.6	131	7 46.7	−156
20	67 16.3	98 15.0	13.5	90 07.4	35.9	84 55.8	36.7	244 22.9	21.3	234 09.7	131	8 02.3	−157
21	82 18.8	113 14.5	·· 12.4	105 08.1	·· 35.2	99 57.8	·· 36.5	259 25.4	·· 21.3	248 41.8	131	· 8 18.0	−156
22	97 21.2	128 13.9	11.4	120 08.7	34.5	114 59.7	36.2	274 27.9	21.4	263 13.9	129	8 33.6	−155
23	112 23.7	143 13.3	10.3	135 09.3	33.7	130 01.7	36.0	289 30.4	21.4	277 45.8	130	8 49.1	−155
0	127 26.2	158 12.8	−14 09.2	150 09.9	−10 33.0	145 03.6	− 8 35.8	304 33.0	+ 1 21.4	292 17.8	128	− 9 04.6	−155
1	142 28.6	173 12.2	08.1	165 10.5	32.2	160 05.6	35.6	319 35.5	21.5	306 49.6	128	9 20.1	−155
2	157 31.1	188 11.7	07.1	180 11.1	31.5	175 07.5	35.4	334 38.0	21.5	321 21.4	127	9 35.6	−154
3	172 33.5	203 11.1	·· 06.0	195 11.7	·· 30.7	190 09.4	·· 35.2	349 40.6	·· 21.6	335 53.1	126	· 9 51.0	−154
4	187 36.0	218 10.5	04.9	210 12.3	30.0	205 11.4	35.0	4 43.1	21.6	350 24.7	126	10 06.4	−154
5	202 38.5	233 10.0	03.9	225 13.0	29.3	220 13.3	34.8	19 45.6	21.6	4 56.3	125	10 21.8	−153
6	217 40.9	248 09.4	−14 02.8	240 13.6	−10 28.5	235 15.3	− 8 34.5	34 48.1	+ 1 21.7	19 27.8	124	−10 37.1	−153
7	232 43.4	263 08.9	01.7	255 14.2	27.8	250 17.2	34.3	49 50.7	21.7	33 59.2	123	10 52.4	−152
8	247 45.9	278 08.3	14 00.6	270 14.8	27.0	265 19.2	34.1	64 53.2	21.8	48 30.5	123	11 07.6	−152
9	262 48.3	293 07.7	·13 59.5	285 15.4	·· 26.3	280 21.1	·· 33.9	79 55.7	·· 21.8	63 01.8	122	·11 22.8	−152
10	277 50.8	308 07.2	58.5	300 16.0	25.6	295 23.0	33.7	94 58.3	21.8	77 33.0	121	11 38.0	−151
11	292 53.3	323 06.6	57.4	315 16.6	24.8	310 25.0	33.5	110 00.8	21.9	92 04.1	121	11 53.1	−150
12	307 55.7	338 06.1	−13 56.3	330 17.3	−10 24.1	325 26.9	− 8 33.3	125 03.3	+ 1 21.9	106 35.2	119	−12 08.1	−151
13	322 58.2	353 05.5	55.2	345 17.9	23.3	340 28.9	33.0	140 05.9	22.0	121 06.1	119	12 23.2	−149
14	338 00.7	8 05.0	54.2	0 18.5	22.6	355 30.8	32.8	155 08.4	22.0	135 37.0	118	12 38.1	−149
15	353 03.1	23 04.4	·· 53.1	15 19.1	·· 21.8	10 32.8	·· 32.6	170 10.9	·· 22.0	150 07.8	117	·12 53.0	−149
16	8 05.6	38 03.9	52.0	30 19.7	21.1	25 34.7	32.4	185 13.5	22.1	164 38.5	116	13 07.9	−148
17	23 08.0	53 03.3	50.9	45 20.3	20.3	40 36.6	32.2	200 16.0	22.1	179 09.1	115	13 22.7	−147
18	38 10.5	68 02.8	−13 49.8	60 20.9	−10 19.6	55 38.6	− 8 32.0	215 18.5	+ 1 22.2	193 39.6	115	−13 37.4	−147
19	53 13.0	83 02.2	48.8	75 21.6	18.9	70 40.5	31.8	230 21.0	22.2	208 10.1	113	13 52.1	−146
20	68 15.4	98 01.7	47.7	90 22.2	18.1	85 42.5	31.5	245 23.6	22.2	222 40.4	113	14 06.7	−146
21	83 17.9	113 01.1	·· 46.6	105 22.8	·· 17.4	100 44.4	·· 31.3	260 26.1	·· 22.3	237 10.7	112	·14 21.3	−145
22	98 20.4	128 00.6	45.5	120 23.4	16.6	115 46.3	31.1	275 28.6	22.3	251 40.9	110	14 35.8	−145
23	113 22.8	143 00.0	44.4	135 24.0	15.9	130 48.3	30.9	290 31.2	22.4	266 10.9	110	14 50.3	−143
0	128 25.3	157 59.5	−13 43.3	150 24.6	−10 15.1	145 50.2	− 8 30.7	305 33.7	+ 1 22.4	280 40.9	109	−15 04.6	−143
1	143 27.8	172 58.9	42.2	165 25.3	14.4	160 52.2	30.5	320 36.2	22.4	295 10.8	108	15 18.9	−143
2	158 30.2	187 58.4	41.2	180 25.9	13.6	175 54.1	30.3	335 38.8	22.5	309 40.6	107	15 33.2	−141
3	173 32.7	202 57.8	·· 40.1	195 26.5	·· 12.9	190 56.0	·· 30.0	350 41.3	·· 22.5	324 10.3	106	·15 47.3	−141
4	188 35.1	217 57.3	39.0	210 27.1	12.2	205 58.0	29.8	5 43.8	22.6	338 39.9	104	16 01.4	−141
5	203 37.6	232 56.7	37.9	225 27.7	11.4	220 59.9	29.6	20 46.4	22.6	353 09.3	104	16 15.5	−139
6	218 40.1	247 56.2	−13 36.8	240 28.3	−10 10.7	236 01.9	− 8 29.4	35 48.9	+ 1 22.7	7 38.7	103	−16 29.4	−139
7	233 42.5	262 55.6	35.7	255 29.0	09.9	251 03.8	29.2	50 51.4	22.7	22 08.0	102	16 43.3	−138
8	248 45.0	277 55.1	34.6	270 29.6	09.2	266 05.7	29.0	65 54.0	22.7	36 37.2	101	16 57.1	−137
9	263 47.5	292 54.5	·· 33.5	285 30.2	·· 08.4	281 07.7	·· 28.7	80 56.5	·· 22.8	51 06.3	99	·17 10.8	−136
10	278 49.9	307 54.0	32.4	300 30.8	07.7	296 09.6	28.5	95 59.0	22.8	65 35.2	99	17 24.4	−136
11	293 52.4	322 53.5	31.3	315 31.4	06.9	311 11.6	28.3	111 01.6	22.9	80 04.1	98	17 38.0	−134
12	308 54.9	337 52.9	−13 30.2	330 32.1	−10 06.2	326 13.5	− 8 28.1	126 04.1	+ 1 22.9	94 32.9	96	−17 51.4	−134
13	323 57.3	352 52.4	29.2	345 32.7	05.4	341 15.4	27.9	141 06.6	23.0	109 01.5	95	18 04.8	−133
14	338 59.8	7 51.8	28.1	0 33.3	04.7	356 17.4	27.7	156 09.2	23.0	123 30.0	95	18 18.1	−132
15	354 02.3	22 51.3	·· 27.0	15 33.9	·· 03.9	11 19.3	·· 27.5	171 11.7	·· 23.0	137 58.5	93	·18 31.3	−131
16	9 04.7	37 50.8	25.9	30 34.5	03.2	26 21.3	27.2	186 14.2	23.1	152 26.8	92	18 44.4	−130
17	24 07.2	52 50.2	24.8	45 35.2	02.4	41 23.2	27.0	201 16.8	23.1	166 55.0	91	18 57.4	−129
18	39 09.6	67 49.7	−13 23.7	60 35.8	−10 01.7	56 25.1	− 8 26.8	216 19.3	+ 1 23.2	181 23.1	90	−19 10.3	−128
19	54 12.1	82 49.1	22.6	75 36.4	01.0	71 27.1	26.6	231 21.8	23.2	195 51.1	88	19 23.1	−127
20	69 14.6	97 48.6	21.5	90 37.0	10 00.2	86 29.0	26.4	246 24.4	23.2	210 18.9	88	19 35.8	−126
21	84 17.0	112 48.1	·· 20.4	105 37.6	· 9 59.5	101 30.9	·· 26.2	261 26.9	·· 23.3	224 46.7	86	·19 48.4	−125
22	99 19.5	127 47.5	19.3	120 38.2	58.7	116 32.9	25.9	276 29.5	23.3	239 14.3	85	20 00.9	−124
23	114 22.0	142 47.0	18.2	135 38.9	58.0	131 34.8	25.7	291 32.0	23.4	253 41.8	84	20 13.3	−123
24	129 24.4	157 46.4	−13 17.1	150 39.5	− 9 57.2	146 36.8	− 8 25.5	306 34.5	+ 1 23.4	268 09.2	83	−20 25.6	−122
code	—	− 6	+ 11	+ 6	+ 8	+ 20	+ 3	+ 26	+ 1				

GCT	SUN GHA	SUN Dec.	STARS No.	SHA	Dec.	Transit Mer. Gr.
h	° ′	° ′		° ′	° ′	h m
0	176 47.8	−18 28.0	1	358 32.4	+28 49.3	15 34
1	191 47.7	27.3	2	358 22.3	+58 53.0	15 34
2	206 47.5	26.7	3	349 43.0	−18 15.4	16 09
3	221 47.4	·· 26.1	4	339 21.4	+59 59.2	16 50
4	236 47.3	25.4	5	336 01.5	−57 29.3	17 03
5	251 47.2	24.8				
6	266 47.0	−18 24.1	6	332 47.4	+89 02.5	17 16
7	281 46.9	23.5	7	328 53.9	+23 14.1	17 32
8	296 46.8	22.8	8	315 53.7	−40 30.1	18 24
9	311 46.7	·· 22.2	9	309 47.6	+49 41.6	18 48
10	326 46.5	21.5	10	291 43.1	+16 24.9	20 00
11	341 46.4	20.9				
12	356 46.3	−18 20.2	11	281 56.9	− 8 15.4	20 39
13	11 46.2	19.6	12	281 43.6	+45 57.3	20 40
14	26 46.1	18.9	13	279 22.1	+ 6 18.5	20 49
15	41 45.9	·· 18.3	14	279 11.7	+28 34.3	20 50
16	56 45.8	17.6	15	276 33.8	− 1 13.8	21 01
17	71 45.7	16.9				
18	86 45.6	−18 16.3	16	271 51.8	+ 7 24.1	21 19
19	101 45.5	15.6	17	264 16.6	−52 40.1	21 50
20	116 45.3	15.0	18	259 14.8	−16 38.8	22 10
21	131 45.2	·· 14.3	19	255 49.1	−28 54.3	22 23
22	146 45.1	13.7	20	245 48.5	+ 5 21.1	23 03
23	161 45.0	13.0				
			21	244 24.7	+28 08.8	23 09
0	176 44.9	−18 12.3	22	234 36.8	−59 21.0	23 48
1	191 44.7	11.7	23	223 26.7	−43 14.0	0 36
2	206 44.6	11.0	24	221 49.3	−69 30.8	0 43
3	221 44.5	·· 10.4	25	218 41.9	− 8 26.7	0 55
4	236 44.4	09.7				
5	251 44.3	09.0	26	208 33.1	+12 12.4	1 36
6	266 44.2	−18 08.4	27	194 48.2	+62 00.7	2 31
7	281 44.0	07.7	28	183 21.2	+14 50.6	3 16
8	296 43.9	07.1	29	174 01.9	−62 49.5	3 53
9	311 43.8	·· 06.4	30	172 53.3	−56 50.2	3 58
10	326 43.7	05.7				
11	341 43.6	05.1	31	168 47.2	−59 25.1	4 14
12	356 43.5	−18 04.4	32	167 01.3	+56 13.1	4 21
13	11 43.4	03.7	33	159 30.2	+55 10.4	4 51
14	26 43.2	03.1	34	159 20.7	−10 54.5	4 52
15	41 43.1	·· 02.4	35	153 35.5	+49 33.0	5 15
16	56 43.0	01.7				
17	71 42.9	01.1	36	149 03.1	−36 07.8	5 33
18	86 42.8	−18 00.4	37	146 38.5	+19 25.9	5 43
19	101 42.7	17 59.7	38	140 56.3	−60 38.0	6 06
20	116 42.6	59.1	39	137 17.4	+74 20.9	6 20
21	131 42.5	·· 58.4	40	126 50.8	+26 52.3	7 02
22	146 42.4	57.7				
23	161 42.2	57.1	41	120 38.6	−22 29.1	7 26
			42	113 24.1	−26 19.6	7 55
0	176 42.1	−17 56.4	43	109 08.5	−68 56.4	8 12
1	191 42.0	55.7	44	103 06.6	−15 40.1	8 36
2	206 41.9	55.0	45	97 26.0	−37 04.3	8 59
3	221 41.8	·· 54.4				
4	236 41.7	53.7	46	96 50.3	+12 35.4	9 01
5	251 41.6	53.0	47	91 08.4	+51 29.3	9 24
6	266 41.5	−17 52.3	48	84 46.4	−34 24.7	9 50
7	281 41.4	51.7	49	81 11.1	+38 43.9	10 04
8	296 41.3	51.0	50	76 56.8	−26 21.7	10 21
9	311 41.2	·· 50.3				
10	326 41.1	49.6	51	62 54.3	+ 8 44.1	11 17
11	341 41.0	49.0	52	54 33.5	−56 53.8	11 50
12	356 40.9	−17 48.3	53	50 04.1	+45 06.1	12 08
13	11 40.8	47.6	54	34 33.5	+ 9 38.9	13 10
14	26 40.6	46.9	55	28 42.8	−47 12.1	13 33
15	41 40.5	·· 46.2				
16	56 40.4	45.6	56	16 15.9	−29 53.1	14 23
17	71 40.3	44.9	57	14 25.4	+14 56.5	14 30
18	86 40.2	−17 44.2				
19	101 40.1	43.5				
20	116 40.0	42.8				
21	131 39.9	·· 42.1				
22	146 39.8	41.5				
23	161 39.7	40.8				
24	176 39.6	−17 40.1				
code	−	+ 7				

GCT	Equation of Time (App.—Mean) 28	29	30
h	m s	m s	m s
0	−12 48.6	−13 00.3	−13 11.2
6	−12 51.6	−13 03.1	−13 13.8
12	−12 54.6	−13 05.9	−13 16.4
18	−12 57.5	−13 08.6	−13 18.9
24	−13 00.3	−13 11.2	−13 21.3

Lat.	Sunrise	Twlt. begins	Moonrise 28	29	30	31
N °	h m	h m	h m	h m	h m	h m
70	10 06	6 03	24 19	0 19	2 49	■
68	9 33	6 02	24 06	0 06	2 19	5 40
66	9 09	6 00	23 56	25 58	1 58	4 25
64	8 51	5 58	23 48	25 41	1 41	3 49
62	8 35	5 57	23 41	25 27	1 27	3 23
60	8 22	5 56	23 35	25 15	1 15	3 03
58	8 11	5 53	23 29	25 05	1 05	2 47
56	8 02	5 53	23 25	24 56	0 56	2 33
54	7 53	5 51	23 20	24 48	0 48	2 21
52	7 46	5 49	23 17	24 41	0 41	2 10
50	7 39	5 47	23 13	24 35	0 35	2 01
45	7 24	5 43	23 06	24 22	0 22	1 41
40	7 12	5 39	23 00	24 11	0 11	1 25
35	7 02	5 35	22 54	24 02	0 02	1 12
30	6 52	5 30	22 50	23 54	25 01	1 01
20	6 37	5 21	22 42	23 40	24 41	0 41
10	6 23	5 10	22 35	23 28	24 24	0 24
0	6 10	4 57	22 29	23 16	24 08	0 08
10	5 56	4 41	22 22	23 05	23 53	24 46
20	5 42	4 21	22 16	22 54	23 36	24 25
30	5 25	3 54	22 08	22 40	23 17	24 01
35	5 16	3 37	22 04	22 33	23 06	23 47
40	5 04	3 14	21 59	22 24	22 54	23 31
45	4 51	2 44	21 53	22 14	22 39	23 12
50	4 35	1 56	21 47	22 02	22 22	22 49
52	4 28	1 25	21 43	21 56	22 13	22 37
54	4 19	////	21 40	21 50	22 04	22 24
56	4 09	////	21 36	21 44	21 54	22 10
58	3 59	////	21 32	21 36	21 42	21 53
60	3 46	////	21 28	21 27	21 28	21 32
S						

Lat.	Sunset	Twlt. ends	Moonset 28	29	30	31
N °	h m	h m	h m	h m	h m	h m
70	14 21	18 27	9 04	8 32	7 44	■
68	14 54	18 28	9 10	8 47	8 15	6 43
66	15 18	18 29	9 15	8 59	8 38	8 01
64	15 37	18 31	9 19	9 09	8 57	8 38
62	15 52	18 32	9 23	9 18	9 12	9 05
60	16 05	18 34	9 26	9 25	9 25	9 26
58	16 16	18 35	9 29	9 32	9 36	9 43
56	16 25	18 36	9 32	9 38	9 46	9 58
54	16 34	18 38	9 34	9 43	9 54	10 10
52	16 41	18 39	9 36	9 47	10 02	10 21
50	16 48	18 40	9 38	9 52	10 09	10 31
45	17 03	18 45	9 42	10 01	10 24	10 52
40	17 15	18 48	9 46	10 09	10 37	11 10
35	17 25	18 52	9 49	10 16	10 47	11 24
30	17 34	18 56	9 52	10 22	10 57	11 37
20	17 50	19 06	9 56	10 33	11 13	11 58
10	18 04	19 17	10 01	10 42	11 27	12 17
0	18 17	19 29	10 05	10 51	11 41	12 35
10	18 30	19 44	10 09	11 00	11 54	12 52
20	18 44	20 04	10 13	11 09	12 08	13 12
30	19 00	20 30	10 18	11 20	12 25	13 34
35	19 10	20 47	10 20	11 26	12 35	13 47
40	19 21	21 10	10 24	11 33	12 46	14 02
45	19 34	21 39	10 27	11 42	12 59	14 20
50	19 50	22 25	10 32	11 52	13 15	14 42
52	19 57	22 54	10 34	11 56	13 23	14 53
54	20 06	24 00	10 36	12 02	13 31	15 05
56	20 15	////	10 38	12 07	13 41	15 19
58	20 26	////	10 41	12 14	13 52	15 35
60	20 38	////	10 44	12 21	14 05	15 56
S						

GCT of Transit Meridian of Greenwich

DAY	Moon	Venus	Mars	Jupiter	Saturn
	h m	h m	h m	h m	h m
28	3 54	13 27	14 00	14 21	3 45
29	4 40	13 28	13 59	14 18	3 41
30	5 28	13 29	13 58	14 15	3 37
31	6 21	13 29	13 57	14 12	3 33

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb	Venus	Mars
°	′	′	′
0			
	0.6	0.1	0.1
30			
	0.6	0.1	0.1
45			
	0.6	0.1	0.0
60			
	0.6	0.0	0.0
75			
	0.6	0.0	0.0
90			

Moon's Lower Limb *Add*

Alt.	28	29	30
°	′	′	′
0			
	16.6	17.2	17.8
4			
	16.6	17.2	17.8
8			
	16.6	17.2	17.8
12			
	16.5	17.2	17.8
16			
	16.5	17.1	17.8
20			
	16.5	17.1	17.7
24			
	16.5	17.1	17.7
28			
	16.5	17.0	17.6
32			
	16.4	17.0	17.5
36			
	16.4	16.9	17.5
40			
	16.4	16.9	17.4
44			
	16.3	16.8	17.3
48			
	16.3	16.7	17.2
52			
	16.2	16.7	17.1
56			
	16.2	16.6	17.0
60			
	16.1	16.5	16.9
64			
	16.1	16.4	16.8
68			
	16.0	16.4	16.7
72			
	16.0	16.3	16.5
76			
	15.9	16.2	16.4
80			
	15.9	16.1	16.3
84			
	15.8	16.0	16.2
88			
	15.8	15.9	16.1
90			

Add to table, back cover

Moon's Upper Limb *Subtract*

Alt.	28	29	30
°	′	′	′
0			
	15.0	14.6	14.2
4			
	15.0	14.6	14.3
8			
	15.0	14.6	14.3
12			
	15.0	14.6	14.3
16			
	15.0	14.7	14.3
20			
	15.0	14.7	14.4
24			
	15.0	14.7	14.4
28			
	15.1	14.8	14.5
32			
	15.1	14.8	14.5
36			
	15.1	14.9	14.6
40			
	15.2	14.9	14.7
44			
	15.2	15.0	14.8
48			
	15.3	15.1	14.9
52			
	15.3	15.1	15.0
56			
	15.3	15.2	15.1
60			
	15.4	15.3	15.2
64			
	15.4	15.4	15.3
68			
	15.5	15.5	15.4
72			
	15.5	15.5	15.5
76			
	15.6	15.6	15.7
80			
	15.7	15.7	15.8
84			
	15.7	15.8	15.9
88			
	15.8	15.9	16.0
90			

Subtract from table, back cover

Last Quarter 30

GCT	♈ GHA	VENUS −3.3 GHA	VENUS Dec.	MARS 1.4 GHA	MARS Dec.	JUPITER −1.6 GHA	JUPITER Dec.	SATURN 0.9 GHA	SATURN Dec.	MOON GHA	code	MOON Dec.	code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
0	129 24.4	157 46.4	−13 17.1	150 39.5	− 9 57.2	146 36.8	− 8 25.5	306 34.5	+ 1 23.4	268 09.2	83	−20 25.6	−122
1	144 26.9	172 45.9	16.0	165 40.1	56.5	161 38.7	25.3	321 37.1	23.5	282 36.5	82	20 37.8	−121
2	159 29.4	187 45.4	14.9	180 40.7	55.7	176 40.6	25.1	336 39.6	23.5	297 03.7	80	20 49.9	−119
3	174 31.8	202 44.8	·· 13.8	195 41.3	·· 55.0	191 42.6	·· 24.9	351 42.1	·· 23.6	311 30.7	80	·21 01.8	−119
4	189 34.3	217 44.3	12.7	210 42.0	54.2	206 44.5	24.6	6 44.7	23.6	325 57.7	78	21 13.7	−117
5	204 36.8	232 43.8	11.6	225 42.6	53.5	221 46.5	24.4	21 47.2	23.6	340 24.5	77	21 25.4	−116
6	219 39.2	247 43.2	−13 10.5	240 43.2	− 9 52.7	236 48.4	− 8 24.2	36 49.7	+ 1 23.7	354 51.2	75	−21 37.0	−115
7	234 41.7	262 42.7	09.3	255 43.8	52.0	251 50.3	24.0	51 52.3	23.7	9 17.7	75	21 48.5	−114
8	249 44.1	277 42.2	08.2	270 44.5	51.2	266 52.3	23.8	66 54.8	23.8	23 44.2	73	21 59.9	−112
9	264 46.6	292 41.6	·· 07.1	285 45.1	·· 50.5	281 54.2	·· 23.6	81 57.4	·· 23.8	38 10.5	72	·22 11.1	−111
10	279 49.1	307 41.1	06.0	300 45.7	49.7	296 56.1	23.4	96 59.9	23.9	52 36.7	71	22 22.2	−110
11	294 51.5	322 40.6	04.9	315 46.3	49.0	311 58.1	23.1	112 02.4	23.9	67 02.8	70	22 33.2	−109
12	309 54.0	337 40.0	−13 03.8	330 46.9	− 9 48.2	327 00.0	− 8 22.9	127 05.0	+ 1 23.9	81 28.8	69	−22 44.1	−107
13	324 56.5	352 39.5	02.7	345 47.6	47.5	342 02.0	22.7	142 07.5	24.0	95 54.7	67	22 54.8	−106
14	339 58.9	7 39.0	01.6	0 48.2	46.7	357 03.9	22.5	157 10.1	24.0	110 20.4	66	23 05.4	−105
15	355 01.4	22 38.5	·13 00.5	15 48.8	·· 46.0	12 05.8	·· 22.3	172 12.6	·· 24.1	124 46.0	65	·23 15.9	−103
16	10 03.9	37 37.9	12 59.4	30 49.4	45.2	27 07.8	22.1	187 15.1	24.1	139 11.5	64	23 26.2	−102
17	25 06.3	52 37.4	58.3	45 50.1	44.5	42 09.7	21.8	202 17.7	24.2	153 36.9	62	23 36.4	−100
18	40 08.8	67 36.9	−12 57.2	60 50.7	− 9 43.7	57 11.6	− 8 21.6	217 20.2	+ 1 24.2	168 02.1	62	−23 46.4	− 99
19	55 11.3	82 36.3	56.0	75 51.3	43.0	72 13.6	21.4	232 22.7	24.2	182 27.3	60	23 56.3	− 98
20	70 13.7	97 35.8	54.9	90 51.9	42.2	87 15.5	21.2	247 25.3	24.3	196 52.3	59	24 06.1	− 96
21	85 16.2	112 35.3	·· 53.8	105 52.5	·· 41.5	102 17.5	·· 21.0	262 27.8	·· 24.3	211 17.2	57	·24 15.7	− 95
22	100 18.6	127 34.8	52.7	120 53.2	40.7	117 19.4	20.8	277 30.4	24.4	225 41.9	57	24 25.2	− 93
23	115 21.1	142 34.2	51.6	135 53.8	39.9	132 21.3	20.5	292 32.9	24.4	240 06.6	56	24 34.5	− 91
0	130 23.6	157 33.7	−12 50.5	150 54.4	− 9 39.2	147 23.3	− 8 20.3	307 35.4	+ 1 24.5	254 31.2	54	−24 43.6	− 90
1	145 26.0	172 33.2	49.4	165 55.0	38.4	162 25.2	20.1	322 38.0	24.5	268 55.6	53	24 52.6	− 89
2	160 28.5	187 32.7	48.2	180 55.7	37.7	177 27.1	19.9	337 40.5	24.6	283 19.9	52	25 01.5	− 87
3	175 31.0	202 32.1	·· 47.1	195 56.3	·· 36.9	192 29.1	·· 19.7	352 43.1	·· 24.6	297 44.1	51	·25 10.2	− 85
4	190 33.4	217 31.6	46.0	210 56.9	36.2	207 31.0	19.5	7 45.6	24.7	312 08.2	50	25 18.7	− 84
5	205 35.9	232 31.1	44.9	225 57.5	35.4	222 32.9	19.2	22 48.1	24.7	326 32.2	48	25 27.1	− 82
6	220 38.4	247 30.6	−12 43.8	240 58.2	− 9 34.7	237 34.9	− 8 19.0	37 50.7	+ 1 24.7	340 56.0	48	−25 35.3	− 80
7	235 40.8	262 30.1	42.6	255 58.8	33.9	252 36.8	18.8	52 53.2	24.8	355 19.8	46	25 43.3	− 79
8	250 43.3	277 29.5	41.5	270 59.4	33.2	267 38.8	18.6	67 55.8	24.8	9 43.4	46	25 51.2	− 77
9	265 45.7	292 29.0	·· 40.4	286 00.0	·· 32.4	282 40.7	·· 18.4	82 58.3	·· 24.9	24 07.0	44	·25 58.9	− 76
10	280 48.2	307 28.5	39.3	301 00.7	31.7	297 42.6	18.2	98 00.8	24.9	38 30.4	43	26 06.5	− 73
11	295 50.7	322 28.0	38.2	316 01.3	30.9	312 44.6	17.9	113 03.4	25.0	52 53.7	42	26 13.8	− 72
12	310 53.1	337 27.5	−12 37.0	331 01.9	− 9 30.2	327 46.5	− 8 17.7	128 05.9	+ 1 25.0	67 16.9	42	−26 21.0	− 70
13	325 55.6	352 26.9	35.9	346 02.5	29.4	342 48.4	17.5	143 08.5	25.1	81 40.1	40	26 28.0	− 69
14	340 58.1	7 26.4	34.8	1 03.2	28.6	357 50.4	17.3	158 11.0	25.1	96 03.1	39	26 34.9	− 67
15	356 00.5	22 25.9	·· 33.7	16 03.8	·· 27.9	12 52.3	·· 17.1	173 13.6	·· 25.1	110 26.0	38	·26 41.6	− 64
16	11 03.0	37 25.4	32.5	31 04.4	27.1	27 54.2	16.8	188 16.1	25.2	124 48.8	38	26 48.0	− 63
17	26 05.5	52 24.9	31.4	46 05.1	26.4	42 56.2	16.6	203 18.6	25.2	139 11.6	36	26 54.3	− 62
18	41 07.9	67 24.4	−12 30.3	61 05.7	− 9 25.6	57 58.1	− 8 16.4	218 21.2	+ 1 25.3	153 34.2	35	−27 00.5	− 59
19	56 10.4	82 23.8	29.2	76 06.3	24.9	73 00.0	16.2	233 23.7	25.3	167 56.7	35	27 06.4	− 58
20	71 12.9	97 23.3	28.0	91 06.9	24.1	88 02.0	16.0	248 26.3	25.4	182 19.2	34	27 12.2	− 55
21	86 15.3	112 22.8	·· 26.9	106 07.6	·· 23.4	103 03.9	·· 15.8	263 28.8	·· 25.4	196 41.6	32	·27 17.7	− 54
22	101 17.8	127 22.3	25.8	121 08.2	22.6	118 05.9	15.5	278 31.4	25.5	211 03.8	32	27 23.1	− 52
23	116 20.2	142 21.8	24.6	136 08.8	21.9	133 07.8	15.3	293 33.9	25.5	225 26.0	31	27 28.3	− 50
0	131 22.7	157 21.3	−12 23.5	151 09.4	− 9 21.1	148 09.7	− 8 15.1	308 36.4	+ 1 25.6	239 48.1	31	−27 33.3	− 48
1	146 25.2	172 20.8	22.4	166 10.1	20.3	163 11.7	14.9	323 39.0	25.6	254 10.2	29	27 38.1	− 46
2	161 27.6	187 20.2	21.3	181 10.7	19.6	178 13.6	14.7	338 41.5	25.7	268 32.1	29	27 42.7	− 44
3	176 30.1	202 19.7	·· 20.1	196 11.3	·· 18.8	193 15.5	·· 14.5	353 44.1	·· 25.7	282 54.0	28	·27 47.1	− 42
4	191 32.6	217 19.2	19.0	211 12.0	18.1	208 17.5	14.2	8 46.6	25.7	297 15.8	28	27 51.3	− 41
5	206 35.0	232 18.7	17.9	226 12.6	17.3	223 19.4	14.0	23 49.2	25.8	311 37.6	26	27 55.4	− 38
6	221 37.5	247 18.2	−12 16.7	241 13.2	− 9 16.6	238 21.3	− 8 13.8	38 51.7	+ 1 25.8	325 59.2	27	−27 59.2	− 36
7	236 40.0	262 17.7	15.6	256 13.8	15.8	253 23.3	13.6	53 54.3	25.9	340 20.9	25	28 02.8	− 34
8	251 42.4	277 17.2	14.5	271 14.5	15.1	268 25.2	13.4	68 56.8	25.9	354 42.4	25	28 06.2	− 32
9	266 44.9	292 16.7	·· 13.3	286 15.1	·· 14.3	283 27.1	·· 13.1	83 59.3	·· 26.0	9 03.9	24	·28 09.4	− 31
10	281 47.4	307 16.2	12.2	301 15.7	13.5	298 29.1	12.9	99 01.9	26.0	23 25.3	24	28 12.5	− 28
11	296 49.8	322 15.7	11.1	316 16.4	12.8	313 31.0	12.7	114 04.4	26.1	37 46.7	24	28 15.3	− 26
12	311 52.3	337 15.2	−12 09.9	331 17.0	− 9 12.0	328 32.9	− 8 12.5	129 07.0	+ 1 26.1	52 08.1	22	−28 17.9	− 24
13	326 54.7	352 14.6	08.8	346 17.6	11.3	343 34.9	12.3	144 09.5	26.2	66 29.3	23	28 20.3	− 22
14	341 57.2	7 14.1	07.6	1 18.2	10.5	358 36.8	12.1	159 12.1	26.2	80 50.6	22	28 22.5	− 20
15	356 59.7	22 13.6	·· 06.5	16 18.9	·· 09.7	13 38.7	·· 11.8	174 14.6	·· 26.3	95 11.8	21	·28 24.5	− 18
16	12 02.1	37 13.1	05.4	31 19.5	09.0	28 40.7	11.6	189 17.2	26.3	109 32.9	21	28 26.3	− 16
17	27 04.6	52 12.6	04.2	46 20.1	08.2	43 42.6	11.4	204 19.7	26.4	123 54.0	21	28 27.9	− 13
18	42 07.1	67 12.1	−12 03.1	61 20.8	− 9 07.5	58 44.5	− 8 11.2	219 22.3	+ 1 26.4	138 15.1	21	−28 29.2	− 12
19	57 09.5	82 11.6	01.9	76 21.4	06.7	73 46.5	11.0	234 24.8	26.4	152 36.2	20	28 30.4	− 9
20	72 12.0	97 11.1	12 00.8	91 22.0	06.0	88 48.4	10.7	249 27.4	26.5	166 57.2	20	28 31.3	− 8
21	87 14.5	112 10.6	·11 59.7	106 22.7	·· 05.2	103 50.3	·· 10.5	264 29.9	·· 26.5	181 18.2	20	·28 32.1	− 5
22	102 16.9	127 10.1	58.5	121 23.3	04.4	118 52.3	10.3	279 32.5	26.6	195 39.2	20	28 32.6	− 4
23	117 19.4	142 09.6	57.4	136 23.9	03.7	133 54.2	10.1	294 35.0	26.6	210 00.2	20	28 33.0	− 1
24	132 21.9	157 09.1	−11 56.2	151 24.5	− 9 02.9	148 56.1	− 8 09.9	309 37.5	+ 1 26.7	224 21.2	19	−28 33.1	+ 1
code	—	− 6	+ 11	+ 6	+ 8	+ 19	+ 2	+ 26	+ 1				

GCT	SUN GHA	SUN Dec.
h	° ′	° ′
0	176 39.6	−17 40.1
1	191 39.5	39.4
2	206 39.4	38.7
3	221 39.3	·· 38.0
4	236 39.2	37.3
5	251 39.1	36.6
6	266 39.0	−17 36.0
7	281 38.9	35.3
8	296 38.8	34.6
9	311 38.7	·· 33.9
10	326 38.6	33.2
11	341 38.5	32.5
12	356 38.4	−17 31.8
13	11 38.3	31.1
14	26 38.2	30.4
15	41 38.1	·· 29.7
16	56 38.0	29.0
17	71 38.0	28.3
18	86 37.9	−17 27.7
19	101 37.8	27.0
20	116 37.7	26.3
21	131 37.6	·· 25.6
22	146 37.5	24.9
23	161 37.4	24.2
0	176 37.3	−17 23.5
1	191 37.2	22.8
2	206 37.1	22.1
3	221 37.0	·· 21.4
4	236 36.9	20.7
5	251 36.8	20.0
6	266 36.7	−17 19.3
7	281 36.7	18.6
8	296 36.6	17.9
9	311 36.5	·· 17.2
10	326 36.4	16.5
11	341 36.3	15.8
12	356 36.2	−17 15.1
13	11 36.1	14.3
14	26 36.0	13.6
15	41 35.9	·· 12.9
16	56 35.9	12.2
17	71 35.8	11.5
18	86 35.7	−17 10.8
19	101 35.6	10.1
20	116 35.5	09.4
21	131 35.4	·· 08.7
22	146 35.3	08.0
23	161 35.3	07.3
0	176 35.2	−17 06.6
1	191 35.1	05.8
2	206 35.0	05.1
3	221 34.9	·· 04.4
4	236 34.8	03.7
5	251 34.8	03.0
6	266 34.7	−17 02.3
7	281 34.6	01.6
8	296 34.5	00.8
9	311 34.4	·17 00.1
10	326 34.3	16 59.4
11	341 34.3	58.7
12	356 34.2	−16 58.0
13	11 34.1	57.3
14	26 34.0	56.5
15	41 33.9	·· 55.8
16	56 33.9	55.1
17	71 33.8	54.4
18	86 33.7	−16 53.7
19	101 33.6	52.9
20	116 33.6	52.2
21	131 33.5	·· 51.5
22	146 33.4	50.8
23	161 33.3	50.1
24	176 33.2	−16 49.3
code	—	+ 8

STARS No.	SHA	Dec.	Transit Mer. Gr.
	° ′	° ′	h m
1	358 32.4	+28 49.3	15 22
2	358 22.3	+58 53.0	15 22
3	349 43.0	−18 15.4	15 57
4	339 21.4	+59 59.2	16 38
5	336 01.5	−57 29.3	16 52
6	332 48.4	+89 02.5	17 04
7	328 53.9	+23 14.1	17 20
8	315 53.7	−40 30.1	18 12
9	309 47.7	+49 41.6	18 36
10	291 43.1	+16 24.9	19 48
11	281 57.0	− 8 15.4	20 27
12	281 43.6	+45 57.3	20 28
13	279 22.1	+ 6 18.5	20 38
14	279 11.7	+28 34.3	20 38
15	276 33.8	− 1 13.8	20 49
16	271 51.9	+ 7 24.1	21 08
17	264 16.6	−52 40.1	21 38
18	259 14.8	−16 38.8	21 58
19	255 49.1	−28 54.3	22 12
20	245 48.5	+ 5 21.1	22 51
21	244 24.7	+28 08.8	22 57
22	234 36.8	−59 21.0	23 36
23	223 26.7	−43 14.0	0 25
24	221 49.3	−69 30.8	0 31
25	218 41.9	− 8 26.7	0 44
26	208 33.1	+12 12.4	1 24
27	194 48.2	+62 00.7	2 19
28	183 21.2	+14 50.6	3 05
29	174 01.8	−62 49.5	3 42
30	172 53.3	−56 50.2	3 46
31	168 47.2	−59 25.1	4 03
32	167 01.2	+56 13.2	4 10
33	159 30.2	+55 10.4	4 40
34	159 20.7	−10 54.5	4 40
35	153 35.5	+49 33.0	5 03
36	149 03.0	−36 07.8	5 21
37	146 38.4	+19 25.9	5 31
38	140 56.2	−60 38.0	5 54
39	137 17.3	+74 20.9	6 08
40	126 50.8	+26 52.3	6 50
41	120 38.5	−22 29.2	7 15
42	113 24.1	−26 19.6	7 44
43	109 08.5	−68 56.4	8 01
44	103 06.6	−15 40.1	8 25
45	97 26.0	−37 04.3	8 47
46	96 50.2	+12 35.4	8 50
47	91 08.3	+51 29.3	9 12
48	84 46.4	−34 24.7	9 38
49	81 11.1	+38 43.9	9 52
50	76 56.7	−26 21.7	10 09
51	62 54.3	+ 8 44.0	11 05
52	54 33.5	−56 53.8	11 38
53	50 04.1	+45 06.1	11 56
54	34 33.5	+ 9 38.9	12 58
55	28 42.8	−47 12.1	13 21
56	16 15.9	−29 53.1	14 11
57	14 25.4	+14 56.5	14 18

Lat.	Sunrise	Twlt. begins	Moonrise 31	Moonrise 1	Moonrise 2	Moonrise 3
N °	h m	h m	h m	h m	h m	h m
70	9 49	5 55	■	■	■	■
68	9 20	5 55	5 40	■	■	■
66	8 59	5 53	4 25	■	■	■
64	8 42	5 53	3 49	6 54	■	■
62	8 27	5 51	3 23	5 34	■	■
60	8 16	5 50	3 03	4 58	6 51	8 07
58	8 05	5 49	2 47	4 32	6 12	7 25
56	7 56	5 48	2 33	4 12	5 45	6 57
54	7 48	5 47	2 21	3 55	5 24	6 35
52	7 41	5 46	2 10	3 41	5 06	6 17
50	7 35	5 44	2 01	3 28	4 51	6 01
45	7 21	5 41	1 41	3 02	4 21	5 30
40	7 09	5 37	1 25	2 42	3 57	5 05
35	6 59	5 33	1 12	2 25	3 38	4 45
30	6 51	5 29	1 01	2 11	3 21	4 28
20	6 36	5 20	0 41	1 46	2 53	4 00
10	6 23	5 10	0 24	1 25	2 29	3 35
0	6 10	4 58	0 08	1 05	2 07	3 12
10	5 57	4 43	24 46	0 46	1 45	2 49
20	5 44	4 24	24 25	0 25	1 21	2 24
30	5 28	3 58	24 01	0 01	0 54	1 55
35	5 19	3 41	23 47	24 37	0 37	1 38
40	5 08	3 20	23 31	24 19	0 19	1 19
45	4 56	2 50	23 12	23 56	24 54	0 54
50	4 40	2 08	22 49	23 27	24 23	0 23
52	4 33	1 40	22 37	23 13	24 08	0 08
54	4 25	0 56	22 24	22 57	23 50	25 07
56	4 16	////	22 10	22 38	23 28	24 47
58	4 06	////	21 53	22 14	23 01	24 23
60	3 54	////	21 32	21 44	22 21	23 49
S						

Lat.	Sunset	Twlt. ends	Moonset 31	Moonset 1	Moonset 2	Moonset 3
N °	h m	h m	h m	h m	h m	h m
70	14 39	18 36	■	■	■	■
68	15 08	18 37	6 43	■	■	■
66	15 29	18 37	8 01	■	■	■
64	15 46	18 37	8 38	7 34	■	■
62	16 01	18 39	9 05	8 54	■	■
60	16 12	18 39	9 26	9 31	9 49	10 50
58	16 23	18 41	9 43	9 57	10 28	11 31
56	16 32	18 42	9 58	10 18	10 55	12 00
54	16 40	18 43	10 10	10 35	11 17	12 22
52	16 47	18 44	10 21	10 50	11 35	12 40
50	16 53	18 45	10 31	11 03	11 50	12 55
45	17 07	18 48	10 52	11 30	12 21	13 26
40	17 18	18 51	11 10	11 51	12 45	13 50
35	17 28	18 55	11 24	12 09	13 05	14 10
30	17 37	18 59	11 37	12 24	13 22	14 27
20	17 52	19 08	11 58	12 50	13 50	14 56
10	18 05	19 18	12 17	13 13	14 15	15 20
0	18 17	19 29	12 35	13 34	14 38	15 43
10	18 29	19 43	12 52	13 55	15 00	16 05
20	18 43	20 02	13 12	14 18	15 25	16 29
30	18 59	20 28	13 34	14 44	15 54	16 57
35	19 08	20 44	13 47	15 00	16 10	17 14
40	19 18	21 05	14 02	15 18	16 30	17 33
45	19 31	21 34	14 20	15 40	16 54	17 56
50	19 46	22 16	14 42	16 08	17 25	18 26
52	19 53	22 41	14 53	16 22	17 40	18 40
54	20 01	23 22	15 05	16 38	17 58	18 57
56	20 09	////	15 19	16 56	18 20	19 18
58	20 19	////	15 35	17 19	18 48	19 43
60	20 31	////	15 56	17 50	19 27	20 16
S						

GCT	Equation of Time (App.—Mean) 31	1	2
h	m s	m s	m s
0	−13 21.3	−13 30.7	−13 39.2
6	−13 23.7	−13 32.9	−13 41.2
12	−13 26.1	−13 35.0	−13 43.1
18	−13 28.4	−13 37.1	−13 45.0
24	−13 30.7	−13 39.2	−13 46.9

GCT of Transit Meridian of Greenwich

DAY	Moon	Venus	Mars	Jupiter	Saturn
	h m	h m	h m	h m	h m
31	6 21	13 29	13 57	14 12	3 33
1	7 20	13 30	13 56	14 09	3 29
2	8 22	13 31	13 55	14 06	3 25
3	9 27	13 32	13 54	14 02	3 21

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb	Venus	Mars
°	′	′	′
0			
	0.6	0.1	0.1
30			
	0.6	0.1	0.1
45			
	0.6	0.1	0.0
60			
	0.6	0.0	0.0
75			
	0.6	0.0	0.0
90			

Moon's Lower Limb
Add

Alt.	31	1	2
°	′	′	′
0			
	18.5	19.0	19.4
4			
	18.5	19.0	19.4
8			
	18.4	18.9	19.3
12			
	18.4	18.9	19.3
16			
	18.4	18.9	19.2
20			
	18.3	18.8	19.2
24			
	18.2	18.7	19.1
28			
	18.2	18.6	19.0
32			
	18.1	18.5	18.9
36			
	18.0	18.4	18.7
40			
	17.9	18.3	18.6
44			
	17.8	18.2	18.5
48			
	17.7	18.0	18.3
52			
	17.5	17.9	18.1
56			
	17.4	17.7	18.0
60			
	17.3	17.6	17.8
64			
	17.1	17.4	17.6
68			
	17.0	17.2	17.4
72			
	16.8	17.0	17.2
76			
	16.7	16.8	17.0
80			
	16.5	16.7	16.8
84			
	16.3	16.5	16.6
88			
	16.2	16.3	16.4
90			

Add to table, back cover

Moon's Upper Limb
Subtract

Alt.	31	1	2
°	′	′	′
0			
	13.9	13.6	13.4
4			
	13.9	13.6	13.4
8			
	13.9	13.6	13.4
12			
	13.9	13.7	13.5
16			
	14.0	13.7	13.5
20			
	14.0	13.8	13.6
24			
	14.1	13.9	13.7
28			
	14.2	13.9	13.8
32			
	14.3	14.0	13.9
36			
	14.4	14.2	14.0
40			
	14.5	14.3	14.1
44			
	14.6	14.4	14.3
48			
	14.7	14.5	14.4
52			
	14.8	14.7	14.6
56			
	15.0	14.9	14.8
60			
	15.1	15.0	15.0
64			
	15.2	15.2	15.1
68			
	15.4	15.4	15.3
72			
	15.5	15.5	15.5
76			
	15.7	15.7	15.7
80			
	15.9	15.9	15.9
84			
	16.0	16.1	16.2
88			
	16.1	16.2	16.3
90			

Subtract from table, back cover

GCT	♈	VENUS −3.3		MARS 1.4		JUPITER −1.6		SATURN 0.9		• MOON			
	GHA	GHA	Dec.	GHA	Dec.	GHA	Dec.	GHA	Dec.	GHA	code	Dec.	code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
0	132 21.9	157 09.1	−11 56.2	151 24.5	− 9 02.9	148 56.1	− 8 09.9	309 37.5	+ 1 26.7	224 21.2	19	−28 33.1	+ 1
1	147 24.3	172 08.6	55.1	166 25.2	02.2	163 58.1	09.6	324 40.1	26.7	238 42.1	20	28 33.0	+ 3
2	162 26.8	187 08.1	54.0	181 25.8	01.4	179 00.0	09.4	339 42.6	26.8	253 03.1	19	28 32.7	+ 6
3	177 29.2	202 07.6	52.8	196 26.4	9 00.6	194 01.9	09.2	354 45.2	26.8	267 24.0	19	28 32.1	+ 7
4	192 31.7	217 07.1	51.7	211 27.1	8 59.9	209 03.9	09.0	9 47.7	26.9	281 44.9	20	28 31.4	+ 9
5	207 34.2	232 06.6	50.5	226 27.7	59.1	224 05.8	08.8	24 50.3	26.9	296 05.9	19	28 30.5	+ 12
6	222 36.6	247 06.1	−11 49.4	241 28.3	− 8 58.4	239 07.7	− 8 08.6	39 52.8	+ 1 27.0	310 26.8	20	−28 29.3	+ 13
7	237 39.1	262 05.6	48.2	256 29.0	57.6	254 09.7	08.3	54 55.4	27.0	324 47.8	19	28 28.0	+ 16
8	252 41.6	277 05.1	47.1	271 29.6	56.8	269 11.6	08.1	69 57.9	27.1	339 08.7	20	28 26.4	+ 18
9	267 44.0	292 04.6	45.9	286 30.2	56.1	284 13.5	07.9	85 00.5	27.1	353 29.7	20	28 24.6	+ 20
10	282 46.5	307 04.1	44.8	301 30.9	55.3	299 15.5	07.7	100 03.0	27.2	7 50.7	20	28 22.6	+ 22
11	297 49.0	322 03.6	43.6	316 31.5	54.6	314 17.4	07.5	115 05.6	27.2	22 11.7	21	28 20.4	+ 24
12	312 51.4	337 03.1	−11 42.5	331 32.1	− 8 53.8	329 19.3	− 8 07.2	130 08.1	+ 1 27.3	36 32.8	21	−28 18.0	+ 26
13	327 53.9	352 02.6	41.3	346 32.8	53.0	344 21.3	07.0	145 10.7	27.3	50 53.9	21	28 15.4	+ 28
14	342 56.4	7 02.1	40.2	1 33.4	52.3	359 23.2	06.8	160 13.2	27.4	65 15.0	21	28 12.6	+ 31
15	357 58.8	22 01.6	39.0	16 34.0	51.5	14 25.1	06.6	175 15.8	27.4	79 36.1	22	28 09.5	+ 32
16	13 01.3	37 01.1	37.9	31 34.7	50.8	29 27.1	06.4	190 18.3	27.5	93 57.3	22	28 06.3	+ 35
17	28 03.7	52 00.6	36.7	46 35.3	50.0	44 29.0	06.1	205 20.9	27.5	108 18.5	22	28 02.8	+ 36
18	43 06.2	67 00.2	−11 35.6	61 35.9	− 8 49.2	59 30.9	− 8 05.9	220 23.4	+ 1 27.5	122 39.7	24	−27 59.2	+ 39
19	58 08.7	81 59.7	34.4	76 36.6	48.5	74 32.9	05.7	235 26.0	27.6	137 01.1	23	27 55.3	+ 40
20	73 11.1	96 59.2	33.3	91 37.2	47.7	89 34.8	05.5	250 28.5	27.6	151 22.4	24	27 51.3	+ 43
21	88 13.6	111 58.7	32.1	106 37.8	47.0	104 36.7	05.3	265 31.1	27.7	165 43.8	25	27 47.0	+ 45
22	103 16.1	126 58.2	31.0	121 38.5	46.2	119 38.6	05.0	280 33.6	27.7	180 05.3	25	27 42.5	+ 46
23	118 18.5	141 57.7	29.8	136 39.1	45.4	134 40.6	04.8	295 36.2	27.8	194 26.8	26	27 37.9	+ 49
0	133 21.0	156 57.2	−11 28.6	151 39.7	− 8 44.7	149 42.5	− 8 04.6	310 38.7	+ 1 27.8	208 48.4	26	−27 33.0	+ 51
1	148 23.5	171 56.7	27.5	166 40.4	43.9	164 44.4	04.4	325 41.3	27.9	223 10.0	27	27 27.9	+ 52
2	163 25.9	186 56.2	26.3	181 41.0	43.1	179 46.4	04.2	340 43.8	27.9	237 31.7	28	27 22.7	+ 55
3	178 28.4	201 55.7	25.2	196 41.6	42.4	194 48.3	03.9	355 46.4	28.0	251 53.5	28	27 17.2	+ 57
4	193 30.8	216 55.2	24.0	211 42.3	41.6	209 50.2	03.7	10 48.9	28.0	266 15.3	30	27 11.5	+ 58
5	208 33.3	231 54.8	22.9	226 42.9	40.9	224 52.2	03.5	25 51.5	28.1	280 37.3	30	27 05.7	+ 61
6	223 35.8	246 54.3	−11 21.7	241 43.6	− 8 40.1	239 54.1	− 8 03.3	40 54.0	+ 1 28.1	294 59.3	30	−26 59.6	+ 62
7	238 38.2	261 53.8	20.5	256 44.2	39.3	254 56.0	03.1	55 56.6	28.2	309 21.3	32	26 53.4	+ 64
8	253 40.7	276 53.3	19.4	271 44.8	38.6	269 58.0	02.8	70 59.1	28.2	323 43.5	32	26 47.0	+ 67
9	268 43.2	291 52.8	18.2	286 45.5	37.8	284 59.9	02.6	86 01.7	28.3	338 05.7	33	26 40.3	+ 68
10	283 45.6	306 52.3	17.1	301 46.1	37.0	300 01.8	02.4	101 04.3	28.3	352 28.0	35	26 33.5	+ 70
11	298 48.1	321 51.8	15.9	316 46.7	36.3	315 03.7	02.2	116 06.8	28.4	6 50.5	35	26 26.5	+ 71
12	313 50.6	336 51.3	−11 14.7	331 47.4	− 8 35.5	330 05.7	− 8 02.0	131 09.4	+ 1 28.4	21 13.0	35	−26 19.4	+ 74
13	328 53.0	351 50.9	13.6	346 48.0	34.8	345 07.6	01.7	146 11.9	28.5	35 35.5	37	26 12.0	+ 75
14	343 55.5	6 50.4	12.4	1 48.6	34.0	0 09.5	01.5	161 14.5	28.5	49 58.2	38	26 04.5	+ 78
15	358 58.0	21 49.9	11.2	16 49.3	33.2	15 11.5	01.3	176 17.0	28.6	64 21.0	39	25 56.7	+ 79
16	14 00.4	36 49.4	10.1	31 49.9	32.5	30 13.4	01.1	191 19.6	28.6	78 43.9	40	25 48.8	+ 80
17	29 02.9	51 48.9	08.9	46 50.6	31.7	45 15.3	00.9	206 22.1	28.7	93 06.9	40	25 40.8	+ 83
18	44 05.3	66 48.4	−11 07.7	61 51.2	− 8 30.9	60 17.3	− 8 00.6	221 24.7	+ 1 28.7	107 29.9	42	−25 32.5	+ 84
19	59 07.8	81 48.0	06.6	76 51.8	30.2	75 19.2	00.4	236 27.2	28.8	121 53.1	43	25 24.1	+ 86
20	74 10.3	96 47.5	05.4	91 52.5	29.4	90 21.1	00.2	251 29.8	28.8	136 16.4	44	25 15.5	+ 88
21	89 12.7	111 47.0	04.2	106 53.1	28.6	105 23.0	8 00.0	266 32.3	28.9	150 39.8	45	25 06.7	+ 89
22	104 15.2	126 46.5	03.1	121 53.7	27.9	120 25.0	7 59.8	281 34.9	28.9	165 03.3	46	24 57.8	+ 91
23	119 17.7	141 46.0	01.9	136 54.4	27.1	135 26.9	59.5	296 37.5	29.0	179 26.9	47	24 48.7	+ 93
0	134 20.1	156 45.6	−11 00.7	151 55.0	− 8 26.3	150 28.8	− 7 59.3	311 40.0	+ 1 29.0	193 50.6	48	−24 39.4	+ 94
1	149 22.6	171 45.1	10 59.6	166 55.7	25.6	165 30.8	59.1	326 42.6	29.1	208 14.4	49	24 30.0	+ 96
2	164 25.1	186 44.6	58.4	181 56.3	24.8	180 32.7	58.9	341 45.1	29.1	222 38.3	51	24 20.4	+ 97
3	179 27.5	201 44.1	57.2	196 56.9	24.0	195 34.6	58.7	356 47.7	29.2	237 02.4	51	24 10.7	+ 99
4	194 30.0	216 43.6	56.1	211 57.6	23.3	210 36.6	58.4	11 50.2	29.2	251 26.5	53	24 00.8	+101
5	209 32.5	231 43.2	54.9	226 58.2	22.5	225 38.5	58.2	26 52.8	29.3	265 50.8	54	23 50.7	+102
6	224 34.9	246 42.7	−10 53.7	241 58.8	− 8 21.7	240 40.4	− 7 58.0	41 55.3	+ 1 29.3	280 15.2	55	−23 40.5	+103
7	239 37.4	261 42.2	52.6	256 59.5	21.0	255 42.3	57.8	56 57.9	29.4	294 39.7	56	23 30.2	+105
8	254 39.8	276 41.7	51.4	272 00.1	20.2	270 44.3	57.6	72 00.5	29.4	309 04.3	58	23 19.7	+107
9	269 42.3	291 41.3	50.2	287 00.8	19.5	285 46.2	57.3	87 03.0	29.5	323 29.1	58	23 09.0	+108
10	284 44.8	306 40.8	49.0	302 01.4	18.7	300 48.1	57.1	102 05.6	29.5	337 53.9	60	22 58.2	+109
11	299 47.2	321 40.3	47.9	317 02.0	17.9	315 50.1	56.9	117 08.1	29.6	352 18.9	61	22 47.3	+111
12	314 49.7	336 39.8	−10 46.7	332 02.7	− 8 17.2	330 52.0	− 7 56.7	132 10.7	+ 1 29.6	6 44.0	63	−22 36.2	+112
13	329 52.2	351 39.4	45.5	347 03.3	16.4	345 53.9	56.4	147 13.2	29.7	21 09.3	63	22 25.0	+113
14	344 54.6	6 38.9	44.3	2 04.0	15.6	0 55.8	56.2	162 15.8	29.8	35 34.6	65	22 13.7	+115
15	359 57.1	21 38.4	43.2	17 04.6	14.9	15 57.8	56.0	177 18.4	29.8	50 00.1	65	22 02.2	+116
16	14 59.6	36 37.9	42.0	32 05.2	14.1	30 59.7	55.8	192 20.9	29.9	64 25.6	67	21 50.6	+118
17	30 02.0	51 37.5	40.8	47 05.9	13.3	46 01.6	55.6	207 23.5	29.9	78 51.3	69	21 38.8	+119
18	45 04.5	66 37.0	−10 39.6	62 06.5	− 8 12.6	61 03.6	− 7 55.3	222 26.0	+ 1 30.0	93 17.2	69	−21 26.9	+120
19	60 07.0	81 36.5	38.5	77 07.2	11.8	76 05.5	55.1	237 28.6	30.0	107 43.1	71	21 14.9	+121
20	75 09.4	96 36.1	37.3	92 07.8	11.0	91 07.4	54.9	252 31.1	30.1	122 09.2	72	21 02.8	+122
21	90 11.9	111 35.6	36.1	107 08.5	10.2	106 09.3	54.7	267 33.7	30.1	136 35.4	73	20 50.6	+124
22	105 14.3	126 35.1	34.9	122 09.1	09.5	121 11.3	54.5	282 36.3	30.2	151 01.7	74	20 38.2	+125
23	120 16.8	141 34.6	33.7	137 09.7	08.7	136 13.2	54.2	297 38.8	30.2	165 28.1	76	20 25.7	+126
24	135 19.3	156 34.2	−10 32.6	152 10.4	− 8 07.9	151 15.1	− 7 54.0	312 41.4	+ 1 30.3	179 54.7	77	−20 13.1	+127
code	–	− 4	+ 11	+ 6	+ 7	+ 19	+ 3	+ 25	+ 1				

GCT	SUN GHA	SUN Dec.
h	° ′	° ′
0	176 33.2	−16 49.3
1	191 33.2	48.6
2	206 33.1	47.9
3	221 33.0	•• 47.2
4	236 32.9	46.4
5	251 32.9	45.7
6	266 32.8	−16 45.0
7	281 32.7	44.2
8	296 32.6	43.5
9	311 32.6	•• 42.8
10	326 32.5	42.1
11	341 32.4	41.3
12	356 32.4	−16 40.6
13	11 32.3	39.9
14	26 32.2	39.1
15	41 32.1	•• 38.4
16	56 32.1	37.7
17	71 32.0	36.9
18	86 31.9	−16 36.2
19	101 31.9	35.5
20	116 31.8	34.7
21	131 31.7	•• 34.0
22	146 31.7	33.3
23	161 31.6	32.5
0	176 31.5	−16 31.8
1	191 31.5	31.1
2	206 31.4	30.3
3	221 31.3	•• 29.6
4	236 31.3	28.9
5	251 31.2	28.1
6	266 31.1	−16 27.4
7	281 31.1	26.6
8	296 31.0	25.9
9	311 30.9	•• 25.2
10	326 30.9	24.4
11	341 30.8	23.7
12	356 30.7	−16 22.9
13	11 30.7	22.2
14	26 30.6	21.5
15	41 30.6	•• 20.7
16	56 30.5	20.0
17	71 30.4	19.2
18	86 30.4	−16 18.5
19	101 30.3	17.7
20	116 30.2	17.0
21	131 30.2	•• 16.2
22	146 30.1	15.5
23	161 30.1	14.7
0	176 30.0	−16 14.0
1	191 29.9	13.3
2	206 29.9	12.5
3	221 29.8	•• 11.8
4	236 29.8	11.0
5	251 29.7	10.3
6	266 29.7	−16 09.5
7	281 29.6	08.8
8	296 29.5	08.0
9	311 29.5	•• 07.2
10	326 29.4	06.5
11	341 29.4	05.7
12	356 29.3	−16 05.0
13	11 29.3	04.2
14	26 29.2	03.5
15	41 29.2	•• 02.7
16	56 29.1	02.0
17	71 29.1	01.2
18	86 29.0	−16 00.5
19	101 28.9	15 59.7
20	116 28.9	58.9
21	131 28.8	•• 58.2
22	146 28.8	57.4
23	161 28.7	56.7
24	176 28.7	−15 55.9
code	−	+ 7

STARS No.	SHA	Dec.	Transit Mer. Gr.
	° ′	° ′	h m
1	358 32.5	+28 49.3	15 10
2	358 22.3	+58 53.0	15 11
3	349 43.0	−18 15.4	15 45
4	339 21.5	+59 59.2	16 26
5	336 01.5	−57 29.3	16 40
6	332 49.3	+89 02.5	16 53
7	328 53.9	+23 14.1	17 08
8	315 53.8	−40 30.1	18 00
9	309 47.7	+49 41.6	18 24
10	291 43.1	+16 24.9	19 37
11	281 57.0	− 8 15.4	20 15
12	281 43.6	+45 57.3	20 16
13	279 22.1	+ 6 18.5	20 26
14	279 11.7	+28 34.3	20 26
15	276 33.8	− 1 13.8	20 37
16	271 51.9	+ 7 24.1	20 56
17	264 16.6	−52 40.2	21 26
18	259 14.8	−16 38.8	21 46
19	255 49.1	−28 54.3	22 00
20	245 48.5	+ 5 21.1	22 40
21	244 24.7	+28 08.8	22 45
22	234 36.8	−59 21.1	23 24
23	223 26.7	−43 14.0	0 13
24	221 49.3	−69 30.9	0 19
25	218 41.9	− 8 26.8	0 32
26	208 33.1	+12 12.4	1 12
27	194 48.2	+62 00.7	2 07
28	183 21.2	+14 50.6	2 53
29	174 01.8	−62 49.6	3 30
30	172 53.2	−56 50.2	3 34
31	168 47.1	−59 25.2	3 51
32	167 01.2	+56 13.2	3 58
33	159 30.1	+55 10.4	4 28
34	159 20.7	−10 54.5	4 28
35	153 35.4	+49 33.0	4 51
36	149 03.0	−36 07.8	5 10
37	146 38.4	+19 25.9	5 19
38	140 56.2	−60 38.0	5 42
39	137 17.2	+74 20.9	5 56
40	126 50.7	+26 52.3	6 38
41	120 38.5	−22 29.2	7 03
42	113 24.0	−26 19.6	7 32
43	109 08.4	−68 56.4	7 49
44	103 06.6	−15 40.1	8 13
45	97 25.9	−37 04.3	8 35
46	96 50.2	+12 35.4	8 38
47	91 08.3	+51 29.3	9 01
48	84 46.3	−34 24.7	9 26
49	81 11.1	+38 43.9	9 40
50	76 56.7	−26 21.7	9 57
51	62 54.3	+ 8 44.0	10 53
52	54 33.5	−56 53.7	11 26
53	50 04.1	+45 06.1	11 44
54	34 33.5	+ 9 38.9	12 46
55	28 42.8	−47 12.1	13 10
56	16 15.9	−29 53.1	13 59
57	14 25.4	+14 56.4	14 07

Lat.	Sunrise	Twlt. begins	Moonrise 3	4	5	6
N °	h m	h m	h m	h m	h m	h m
70	9 33	5 46	■	■	■	10 37
68	9 08	5 46	■	■	■	10 00
66	8 48	5 47	■	■	10 21	9 33
64	8 33	5 46	■	■	9 34	9 12
62	8 19	5 45	■	9 16	9 03	8 55
60	8 09	5 45	8 07	8 32	8 39	8 41
58	7 59	5 44	7 25	8 03	8 20	8 29
56	7 51	5 44	6 57	7 40	8 04	8 18
54	7 43	5 43	6 35	7 22	7 51	8 09
52	7 36	5 41	6 17	7 06	7 39	8 00
50	7 30	5 41	6 01	6 53	7 28	7 53
45	7 17	5 38	5 30	6 25	7 06	7 37
40	7 07	5 35	5 05	6 02	6 48	7 23
35	6 57	5 32	4 45	5 44	6 32	7 12
30	6 49	5 28	4 28	5 28	6 19	7 02
20	6 35	5 20	4 00	5 01	5 56	6 44
10	6 22	5 10	3 35	4 38	5 37	6 29
0	6 10	4 58	3 12	4 16	5 18	6 15
10	5 58	4 44	2 49	3 55	4 59	6 00
20	5 46	4 26	2 24	3 31	4 39	5 45
30	5 31	4 02	1 55	3 04	4 16	5 27
35	5 22	3 46	1 38	2 48	4 03	5 17
40	5 12	3 25	1 19	2 30	3 47	5 05
45	5 00	2 58	0 54	2 07	3 28	4 51
50	4 46	2 18	0 23	1 38	3 04	4 33
52	4 39	1 54	0 08	1 24	2 53	4 25
54	4 32	1 21	25 07	1 07	2 39	4 16
56	4 23	////	24 47	0 47	2 24	4 05
58	4 14	////	24 23	0 23	2 06	3 53
60	4 03	////	23 49	25 44	1 44	3 39
S						

Lat.	Sunset	Twlt. ends	Moonset 3	4	5	6
N °	h m	h m	h m	h m	h m	h m
70	14 56	18 46	■	■	■	14 42
68	15 22	18 46	■	■	■	15 18
66	15 41	18 45	■	■	12 59	15 43
64	15 56	18 45	■	■	13 46	16 02
62	16 09	18 45	■	11 56	14 16	16 18
60	16 20	18 45	10 50	12 39	14 38	16 31
58	16 30	18 47	11 31	13 08	14 56	16 42
56	16 38	18 47	12 00	13 30	15 12	16 52
54	16 46	18 48	12 22	13 48	15 25	17 00
52	16 52	18 48	12 40	14 04	15 36	17 08
50	16 58	18 49	12 55	14 17	15 46	17 15
45	17 11	18 52	13 26	14 44	16 07	17 29
40	17 22	18 55	13 50	15 05	16 24	17 41
35	17 31	18 57	14 10	15 23	16 38	17 51
30	17 39	19 01	14 27	15 38	16 50	18 00
20	17 53	19 08	14 56	16 04	17 11	18 15
10	18 06	19 18	15 20	16 26	17 29	18 28
0	18 17	19 29	15 43	16 46	17 46	18 40
10	18 29	19 43	16 05	17 07	18 02	18 52
20	18 42	20 01	16 29	17 28	18 20	19 04
30	18 57	20 25	16 57	17 53	18 40	19 19
35	19 05	20 40	17 14	18 08	18 51	19 27
40	19 15	21 00	17 33	18 24	19 04	19 36
45	19 27	21 27	17 56	18 44	19 20	19 47
50	19 41	22 06	18 26	19 09	19 39	20 00
52	19 48	22 28	18 40	19 21	19 48	20 06
54	19 55	22 59	18 57	19 35	19 58	20 13
56	20 03	////	19 18	19 51	20 09	20 20
58	20 12	////	19 43	20 09	20 22	20 29
60	20 23	////	20 16	20 32	20 37	20 38
S						

GCT	Equation of Time (App.—Mean) 3	4	5
h	m s	m s	m s
0	−13 46.9	−13 53.8	−13 59.9
6	−13 48.7	−13 55.4	−14 01.3
12	−13 50.4	−13 56.9	−14 02.6
18	−13 52.1	−13 58.4	−14 03.9
24	−13 53.8	−13 59.9	−14 05.2

GCT of Transit Meridian of Greenwich

DAY	Moon	Venus	Mars	Jupiter	Saturn
	h m	h m	h m	h m	h m
3	9 27	13 32	13 54	14 02	3 21
4	10 31	13 33	13 53	13 59	3 17
5	11 32	13 33	13 52	13 56	3 13
6	12 28	13 34	13 51	13 53	3 09

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb	Venus	Mars
°	′	′	′
0			
	0.6	0.1	0.1
30			
	0.6	0.1	0.1
45			
	0.6	0.1	0.0
60			
	0.6	0.0	0.0
75			
	0.6	0.0	0.0
90			

Moon's Lower Limb
Add

Alt.	3	4	5
°	′	′	′
0			
	19.5	19.4	19.0
4			
	19.5	19.4	19.0
8			
	19.5	19.3	18.9
12			
	19.4	19.3	18.9
16			
	19.3	19.2	18.9
20			
	19.3	19.2	18.8
24			
	19.2	19.1	18.7
28			
	19.1	19.0	18.6
32			
	19.0	18.9	18.5
36			
	18.8	18.7	18.4
40			
	18.7	18.6	18.3
44			
	18.5	18.5	18.2
48			
	18.4	18.3	18.0
52			
	18.2	18.1	17.9
56			
	18.0	18.0	17.7
60			
	17.9	17.8	17.6
64			
	17.7	17.6	17.4
68			
	17.5	17.4	17.2
72			
	17.2	17.2	17.0
76			
	17.0	17.0	16.8
80			
	16.8	16.8	16.7
84			
	16.6	16.6	16.5
88			
	16.4	16.4	16.3
90			

Add to table, back cover

Moon's Upper Limb
Subtract

Alt.	3	4	5
°	′	′	′
0			
	13.3	13.4	13.6
4			
	13.3	13.4	13.6
8			
	13.3	13.4	13.6
12			
	13.4	13.5	13.7
16			
	13.4	13.5	13.7
20			
	13.5	13.6	13.8
24			
	13.6	13.7	13.9
28			
	13.7	13.8	13.9
32			
	13.8	13.9	14.0
36			
	14.0	14.0	14.2
40			
	14.1	14.1	14.3
44			
	14.2	14.3	14.4
48			
	14.4	14.4	14.5
52			
	14.6	14.6	14.7
56			
	14.8	14.8	14.9
60			
	14.9	15.0	15.0
64			
	15.1	15.1	15.2
68			
	15.3	15.3	15.4
72			
	15.5	15.5	15.5
76			
	15.7	15.7	15.7
80			
	16.0	15.9	15.9
84			
	16.2	16.2	16.1
88			
	16.3	16.3	16.2
90			

Subtract from table, back cover

Quinquagesima (Shrove Sunday) 4

GCT	♈	VENUS −3.3		MARS 1.4		JUPITER −1.6		SATURN 0.9		MOON			
T	GHA	GHA	Dec.	GHA	Dec.	GHA	Dec.	GHA	Dec.	GHA	code	Dec.	code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
0	135 19.3	156 34.2	−10 32.6	152 10.4	− 8 07.9	151 15.1	− 7 54.0	312 41.4	+ 1 30.3	179 54.7	77	−20 13.1	+127
1	150 21.7	171 33.7	31.4	167 11.0	07.2	166 17.1	53.8	327 43.9	30.3	194 21.4	78	20 00.4	+128
2	165 24.2	186 33.2	30.2	182 11.7	06.4	181 19.0	53.6	342 46.5	30.4	208 48.2	79	19 47.6	+129
3	180 26.7	201 32.8	·· 29.0	197 12.3	·· 05.6	196 20.9	·· 53.3	357 49.0	·· 30.4	223 15.1	81	·19 34.7	+130
4	195 29.1	216 32.3	27.8	212 12.9	04.9	211 22.8	53.1	12 51.6	30.5	237 42.2	81	19 21.7	+132
5	210 31.6	231 31.8	26.7	227 13.6	04.1	226 24.8	52.9	27 54.2	30.5	252 09.3	83	19 08.5	+132
6	225 34.1	246 31.4	−10 25.5	242 14.2	− 8 03.3	241 26.7	− 7 52.7	42 56.7	+ 1 30.6	266 36.6	84	−18 55.3	+134
7	240 36.5	261 30.9	24.3	257 14.9	02.6	256 28.6	52.5	57 59.3	30.6	281 04.0	86	18 41.9	+134
8	255 39.0	276 30.4	23.1	272 15.5	01.8	271 30.5	52.2	73 01.8	30.7	295 31.6	86	18 28.5	+135
9	270 41.4	291 30.0	·· 21.9	287 16.2	·· 01.0	286 32.5	·· 52.0	88 04.4	·· 30.7	309 59.2	88	·18 15.0	+137
10	285 43.9	306 29.5	20.7	302 16.8	8 00.3	301 34.4	51.8	103 07.0	30.8	324 27.0	89	18 01.3	+137
11	300 46.4	321 29.0	19.5	317 17.4	7 59.5	316 36.3	51.6	118 09.5	30.8	338 54.9	90	17 47.6	+138
12	315 48.8	336 28.6	−10 18.4	332 18.1	− 7 58.7	331 38.3	− 7 51.4	133 12.1	+ 1 30.9	353 22.9	91	−17 33.8	+139
13	330 51.3	351 28.1	17.2	347 18.7	58.0	346 40.2	51.1	148 14.6	30.9	7 51.0	92	17 19.9	+140
14	345 53.8	6 27.7	16.0	2 19.4	57.2	1 42.1	50.9	163 17.2	31.0	22 19.2	94	17 05.9	+140
15	0 56.2	21 27.2	·· 14.8	17 20.0	·· 56.4	16 44.0	·· 50.7	178 19.8	·· 31.1	36 47.6	94	·16 51.9	+142
16	15 58.7	36 26.7	13.6	32 20.7	55.6	31 46.0	50.5	193 22.3	31.1	51 16.0	96	16 37.7	+142
17	31 01.2	51 26.3	12.4	47 21.3	54.9	46 47.9	50.2	208 24.9	31.2	65 44.6	97	16 23.5	+143
18	46 03.6	66 25.8	−10 11.2	62 21.9	− 7 54.1	61 49.8	− 7 50.0	223 27.5	+ 1 31.2	80 13.3	98	−16 09.2	+144
19	61 06.1	81 25.3	10.0	77 22.6	53.3	76 51.7	49.8	238 30.0	31.3	94 42.1	99	15 54.8	+145
20	76 08.6	96 24.9	08.9	92 23.2	52.6	91 53.7	49.6	253 32.6	31.3	109 11.0	100	15 40.3	+145
21	91 11.0	111 24.4	·· 07.7	107 23.9	·· 51.8	106 55.6	·· 49.4	268 35.1	·· 31.4	123 40.0	101	·15 25.8	+146
22	106 13.5	126 24.0	06.5	122 24.5	51.0	121 57.5	49.1	283 37.7	31.4	138 09.1	103	15 11.2	+146
23	121 15.9	141 23.5	05.3	137 25.2	50.3	136 59.5	48.9	298 40.3	31.5	152 38.4	103	14 56.6	+148
0	136 18.4	156 23.0	−10 04.1	152 25.8	− 7 49.5	152 01.4	− 7 48.7	313 42.8	+ 1 31.5	167 07.7	105	−14 41.8	+148
1	151 20.9	171 22.6	02.9	167 26.5	48.7	167 03.3	48.5	328 45.4	31.6	181 37.2	105	14 27.0	+148
2	166 23.3	186 22.1	01.7	182 27.1	47.9	182 05.2	48.2	343 47.9	31.6	196 06.7	107	14 12.2	+149
3	181 25.8	201 21.7	·10 00.5	197 27.8	·· 47.2	197 07.2	·· 48.0	358 50.5	·· 31.7	210 36.4	108	·13 57.3	+150
4	196 28.3	216 21.2	9 59.3	212 28.4	46.4	212 09.1	47.8	13 53.1	31.7	225 06.2	108	13 42.3	+150
5	211 30.7	231 20.8	58.1	227 29.0	45.6	227 11.0	47.6	28 55.6	31.8	239 36.0	110	13 27.3	+151
6	226 33.2	246 20.3	− 9 56.9	242 29.7	− 7 44.9	242 12.9	− 7 47.4	43 58.2	+ 1 31.9	254 06.0	111	−13 12.2	+152
7	241 35.7	261 19.8	55.7	257 30.3	44.1	257 14.9	47.1	59 00.8	31.9	268 36.1	112	12 57.0	+152
8	256 38.1	276 19.4	54.6	272 31.0	43.3	272 16.8	46.9	74 03.3	32.0	283 06.3	112	12 41.8	+152
9	271 40.6	291 18.9	·· 53.4	287 31.6	·· 42.5	287 18.7	·· 46.7	89 05.9	·· 32.0	297 36.5	114	·12 26.6	+153
10	286 43.1	306 18.5	52.2	302 32.3	41.8	302 20.6	46.5	104 08.4	32.1	312 06.9	114	12 11.3	+153
11	301 45.5	321 18.0	51.0	317 32.9	41.0	317 22.6	46.2	119 11.0	32.1	326 37.3	116	11 56.0	+154
12	316 48.0	336 17.6	− 9 49.8	332 33.6	− 7 40.2	332 24.5	− 7 46.0	134 13.6	+ 1 32.2	341 07.9	117	−11 40.6	+154
13	331 50.4	351 17.1	48.6	347 34.2	39.5	347 26.4	45.8	149 16.1	32.2	355 38.6	117	11 25.2	+155
14	346 52.9	6 16.7	47.4	2 34.9	38.7	2 28.3	45.6	164 18.7	32.3	10 09.3	118	11 09.7	+155
15	1 55.4	21 16.2	·· 46.2	17 35.5	·· 37.9	17 30.3	·· 45.3	179 21.3	·· 32.3	24 40.1	119	·10 54.2	+155
16	16 57.8	36 15.8	45.0	32 36.1	37.1	32 32.2	45.1	194 23.8	32.4	39 11.0	121	10 38.7	+156
17	32 00.3	51 15.3	43.8	47 36.8	36.4	47 34.1	44.9	209 26.4	32.5	53 42.1	121	10 23.1	+156
18	47 02.8	66 14.8	− 9 42.6	62 37.4	− 7 35.6	62 36.0	− 7 44.7	224 29.0	+ 1 32.5	68 13.2	121	−10 07.5	+156
19	62 05.2	81 14.4	41.4	77 38.1	34.8	77 38.0	44.5	239 31.5	32.6	82 44.3	123	9 51.9	+157
20	77 07.7	96 13.9	40.2	92 38.7	34.1	92 39.9	44.2	254 34.1	32.6	97 15.6	124	9 36.2	+157
21	92 10.2	111 13.5	·· 39.0	107 39.4	·· 33.3	107 41.8	·· 44.0	269 36.7	·· 32.7	111 47.0	124	· 9 20.5	+157
22	107 12.6	126 13.0	37.8	122 40.0	32.5	122 43.7	43.8	284 39.2	32.7	126 18.4	125	9 04.8	+157
23	122 15.1	141 12.6	36.6	137 40.7	31.7	137 45.7	43.6	299 41.8	32.8	140 49.9	126	8 49.1	+158
0	137 17.6	156 12.1	− 9 35.4	152 41.3	− 7 31.0	152 47.6	− 7 43.3	314 44.4	+ 1 32.8	155 21.5	127	− 8 33.3	+158
1	152 20.0	171 11.7	34.2	167 42.0	30.2	167 49.5	43.1	329 46.9	32.9	169 53.2	127	8 17.5	+158
2	167 22.5	186 11.2	33.0	182 42.6	29.4	182 51.4	42.9	344 49.5	32.9	184 24.9	129	8 01.7	+159
3	182 24.9	201 10.8	·· 31.8	197 43.3	·· 28.6	197 53.4	·· 42.7	359 52.0	·· 33.0	198 56.8	129	· 7 45.8	+158
4	197 27.4	216 10.4	30.6	212 43.9	27.9	212 55.3	42.4	14 54.6	33.1	213 28.7	129	7 30.0	+159
5	212 29.9	231 09.9	29.4	227 44.6	27.1	227 57.2	42.2	29 57.2	33.1	228 00.6	131	7 14.1	+159
6	227 32.3	246 09.5	− 9 28.1	242 45.2	− 7 26.3	242 59.1	− 7 42.0	44 59.7	+ 1 33.2	242 32.7	131	− 6 58.2	+159
7	242 34.8	261 09.0	26.9	257 45.9	25.5	258 01.1	41.8	60 02.3	33.2	257 04.8	132	6 42.3	+159
8	257 37.3	276 08.6	25.7	272 46.5	24.8	273 03.0	41.5	75 04.9	33.3	271 37.0	133	6 26.4	+159
9	272 39.7	291 08.1	·· 24.5	287 47.2	·· 24.0	288 04.9	·· 41.3	90 07.4	·· 33.3	286 09.3	133	· 6 10.5	+159
10	287 42.2	306 07.7	23.3	302 47.8	23.2	303 06.8	41.1	105 10.0	33.4	300 41.6	134	5 54.6	+160
11	302 44.7	321 07.2	22.1	317 48.5	22.5	318 08.8	40.9	120 12.6	33.4	315 14.0	134	5 38.6	+159
12	317 47.1	336 06.8	− 9 20.9	332 49.1	− 7 21.7	333 10.7	− 7 40.7	135 15.1	+ 1 33.5	329 46.4	135	− 5 22.7	+160
13	332 49.6	351 06.3	19.7	347 49.8	20.9	348 12.6	40.4	150 17.7	33.5	344 18.9	136	5 06.7	+159
14	347 52.0	6 05.9	18.5	2 50.4	20.1	3 14.5	40.2	165 20.3	33.6	358 51.5	137	4 50.8	+160
15	2 54.5	21 05.5	·· 17.3	17 51.1	·· 19.4	18 16.5	·· 40.0	180 22.9	·· 33.7	13 24.2	137	· 4 34.8	+159
16	17 57.0	36 05.0	16.1	32 51.7	18.6	33 18.4	39.8	195 25.4	33.7	27 56.9	137	4 18.9	+160
17	32 59.4	51 04.6	14.9	47 52.4	17.8	48 20.3	39.5	210 28.0	33.8	42 29.6	138	4 02.9	+159
18	48 01.9	66 04.1	− 9 13.7	62 53.0	− 7 17.0	63 22.2	− 7 39.3	225 30.6	+ 1 33.8	57 02.4	139	− 3 47.0	+160
19	63 04.4	81 03.7	12.5	77 53.7	16.3	78 24.2	39.1	240 33.1	33.9	71 35.3	139	3 31.0	+159
20	78 06.8	96 03.2	11.2	92 54.3	15.5	93 26.1	38.9	255 35.7	33.9	86 08.2	140	3 15.1	+160
21	93 09.3	111 02.8	·· 10.0	107 55.0	·· 14.7	108 28.0	·· 38.6	270 38.3	·· 34.0	100 41.2	140	· 2 59.1	+159
22	108 11.8	126 02.4	08.8	122 55.6	13.9	123 29.9	38.4	285 40.8	34.0	115 14.2	141	2 43.2	+159
23	123 14.2	141 01.9	07.6	137 56.3	13.2	138 31.8	38.2	300 43.4	34.1	129 47.3	141	2 27.3	+159
24	138 16.7	156 01.5	− 9 06.4	152 56.9	− 7 12.4	153 33.8	− 7 38.0	315 46.0	+ 1 34.2	144 20.4	142	− 2 11.4	+159
code	—	− 5	+ 12	+ 6	+ 7	+ 19	+ 2	+ 25	0				

GCT	SUN GHA	SUN Dec.
h	° ′	° ′
0	176 28.7	−15 55.9
1	191 28.6	55.2
2	206 28.6	54.4
3	221 28.5	•• 53.6
4	236 28.5	52.9
5	251 28.4	52.1
6	266 28.4	−15 51.3
7	281 28.3	50.6
8	296 28.3	49.8
9	311 28.2	•• 49.1
10	326 28.2	48.3
11	341 28.1	47.5
12	356 28.1	−15 46.8
13	11 28.1	46.0
14	26 28.0	45.2
15	41 28.0	•• 44.5
16	56 27.9	43.7
17	71 27.9	42.9
18	86 27.8	−15 42.2
19	101 27.8	41.4
20	116 27.7	40.6
21	131 27.7	•• 39.9
22	146 27.7	39.1
23	161 27.6	38.3
0	176 27.6	−15 37.5
1	191 27.5	36.8
2	206 27.5	36.0
3	221 27.4	•• 35.2
4	236 27.4	34.5
5	251 27.4	33.7
6	266 27.3	−15 32.9
7	281 27.3	32.1
8	296 27.2	31.4
9	311 27.2	•• 30.6
10	326 27.2	29.8
11	341 27.1	29.0
12	356 27.1	−15 28.3
13	11 27.1	27.5
14	26 27.0	26.7
15	41 27.0	•• 25.9
16	56 26.9	25.2
17	71 26.9	24.4
18	86 26.9	−15 23.6
19	101 26.8	22.8
20	116 26.8	22.0
21	131 26.8	•• 21.3
22	146 26.7	20.5
23	161 26.7	19.7
0	176 26.7	−15 18.9
1	191 26.6	18.1
2	206 26.6	17.4
3	221 26.6	•• 16.6
4	236 26.5	15.8
5	251 26.5	15.0
6	266 26.5	−15 14.2
7	281 26.4	13.4
8	296 26.4	12.6
9	311 26.4	•• 11.9
10	326 26.3	11.1
11	341 26.3	10.3
12	356 26.3	−15 09.5
13	11 26.2	08.7
14	26 26.2	07.9
15	41 26.2	•• 07.1
16	56 26.2	06.4
17	71 26.1	05.6
18	86 26.1	−15 04.8
19	101 26.1	04.0
20	116 26.1	03.2
21	131 26.0	•• 02.4
22	146 26.0	01.6
23	161 26.0	00.8
24	176 25.9	−15 00.0
code	—	+ 8

No.	STARS SHA	Dec.	Transit Mer. Gr.
	° ′	° ′	h m
1	358 32.5	+28 49.3	14 58
2	358 22.3	+58 53.0	14 59
3	349 43.1	−18 15.4	15 33
4	339 21.5	+59 59.2	16 15
5	336 01.5	−57 29.3	16 28
6	332 50.2	+89 02.5	16 41
7	328 53.9	+23 14.1	16 56
8	315 53.8	−40 30.1	17 48
9	309 47.7	+49 41.6	18 13
10	291 43.1	+16 24.9	19 25
11	281 57.0	− 8 15.4	20 04
12	281 43.6	+45 57.3	20 05
13	279 22.2	+ 6 18.5	20 14
14	279 11.7	+28 34.3	20 15
15	276 33.8	− 1 13.8	20 25
16	271 51.9	+ 7 24.1	20 44
17	264 16.6	−52 40.2	21 14
18	259 14.8	−16 38.9	21 34
19	255 49.1	−28 54.3	21 48
20	245 48.5	+ 5 21.1	22 28
21	244 24.7	+28 08.8	22 33
22	234 36.8	−59 21.1	23 13
23	223 26.7	−43 14.0	0 01
24	221 49.3	−69 30.9	0 07
25	218 41.9	− 8 26.8	0 20
26	208 33.0	+12 12.4	1 00
27	194 48.1	+62 00.7	1 55
28	183 21.1	+14 50.6	2 41
29	174 01.8	−62 49.6	3 18
30	172 53.2	−56 50.3	3 23
31	168 47.1	−59 25.2	3 39
32	167 01.2	+56 13.2	3 46
33	159 30.1	+55 10.4	4 16
34	159 20.6	−10 54.5	4 17
35	153 35.4	+49 33.0	4 40
36	149 03.0	−36 07.8	4 58
37	146 38.4	+19 25.9	5 07
38	140 56.1	−60 38.1	5 30
39	137 17.2	+74 20.9	5 45
40	126 50.7	+26 52.3	6 26
41	120 38.5	−22 29.2	6 51
42	113 24.0	−26 19.6	7 20
43	109 08.4	−68 56.4	7 37
44	103 06.6	−15 40.1	8 01
45	97 25.9	−37 04.3	8 24
46	96 50.2	+12 35.3	8 26
47	91 08.3	+51 29.2	8 49
48	84 46.3	−34 24.7	9 14
49	81 11.1	+38 43.9	9 28
50	76 56.7	−26 21.7	9 45
51	62 54.3	+ 8 44.0	10 41
52	54 33.5	−56 53.7	11 15
53	50 04.1	+45 06.1	11 33
54	34 33.5	+ 9 38.8	12 34
55	28 42.8	−47 12.1	12 58
56	16 15.9	−29 53.1	13 47
57	14 25.4	+14 56.4	13 55

Lat.	Sunrise	Twlt. begins	Moonrise 6	Moonrise 7	Moonrise 8	Moonrise 9
N °	h m	h m	h m	h m	h m	h m
70	9 17	5 36	10 37	9 40	9 06	8 38
68	8 55	5 38	10 00	9 24	8 59	8 38
66	8 37	5 39	9 33	9 10	8 53	8 38
64	8 23	5 39	9 12	8 59	8 48	8 38
62	8 11	5 39	8 55	8 49	8 44	8 38
60	8 01	5 39	8 41	8 41	8 40	8 38
58	7 52	5 38	8 29	8 33	8 36	8 38
56	7 44	5 39	8 18	8 27	8 33	8 38
54	7 38	5 38	8 09	8 21	8 30	8 38
52	7 31	5 37	8 00	8 16	8 28	8 38
50	7 26	5 36	7 53	8 11	8 26	8 38
45	7 13	5 35	7 37	8 01	8 20	8 38
40	7 03	5 32	7 23	7 52	8 16	8 38
35	6 55	5 30	7 12	7 44	8 13	8 38
30	6 47	5 27	7 02	7 38	8 09	8 38
20	6 34	5 19	6 44	7 26	8 04	8 38
10	6 22	5 10	6 29	7 16	7 59	8 38
0	6 11	5 00	6 15	7 06	7 54	8 39
10	5 59	4 46	6 00	6 57	7 49	8 39
20	5 47	4 29	5 45	6 46	7 44	8 39
30	5 33	4 05	5 27	6 35	7 38	8 39
35	5 25	3 50	5 17	6 28	7 35	8 39
40	5 15	3 30	5 05	6 20	7 31	8 39
45	5 04	3 04	4 51	6 11	7 27	8 39
50	4 51	2 27	4 33	6 00	7 21	8 39
52	4 45	2 07	4 25	5 54	7 19	8 39
54	4 37	1 39	4 16	5 49	7 16	8 40
56	4 30	0 48	4 05	5 42	7 13	8 40
58	4 21	////	3 53	5 35	7 10	8 40
60	4 11	////	3 39	5 27	7 06	8 40
S						

Lat.	Sunset	Twlt. ends	Moonset 6	Moonset 7	Moonset 8	Moonset 9
N °	h m	h m	h m	h m	h m	h m
70	15 13	18 57	14 42	17 24	19 36	21 38
68	15 35	18 55	15 18	17 39	19 40	21 34
66	15 52	18 54	15 43	17 50	19 44	21 30
64	16 06	18 53	16 02	18 00	19 47	21 28
62	16 18	18 52	16 18	18 08	19 49	21 25
60	16 28	18 52	16 31	18 15	19 51	21 23
58	16 37	18 52	16 42	18 21	19 53	21 21
56	16 45	18 53	16 52	18 26	19 55	21 20
54	16 52	18 53	17 00	18 31	19 56	21 18
52	16 58	18 53	17 08	18 35	19 58	21 17
50	17 03	18 53	17 15	18 39	19 59	21 16
45	17 16	18 56	17 29	18 48	20 02	21 13
40	17 26	18 58	17 41	18 55	20 04	21 11
35	17 34	19 00	17 51	19 00	20 06	21 09
30	17 42	19 03	18 00	19 06	20 08	21 07
20	17 55	19 10	18 15	19 14	20 11	21 04
10	18 07	19 19	18 28	19 22	20 13	21 02
0	18 18	19 29	18 40	19 29	20 15	20 59
10	18 29	19 42	18 52	19 37	20 18	20 57
20	18 41	19 59	19 04	19 44	20 20	20 54
30	18 55	20 22	19 19	19 53	20 23	20 51
35	19 03	20 37	19 27	19 57	20 24	20 50
40	19 12	20 56	19 36	20 03	20 26	20 48
45	19 23	21 21	19 47	20 09	20 28	20 46
50	19 36	21 56	20 00	20 17	20 30	20 43
52	19 43	22 17	20 06	20 20	20 32	20 42
54	19 49	22 43	20 13	20 24	20 33	20 40
56	19 57	23 28	20 20	20 28	20 34	20 39
58	20 06	////	20 29	20 33	20 35	20 37
60	20 16	////	20 38	20 38	20 37	20 36
S						

Equation of Time (App.—Mean)

GCT	6	7	8
h	m s	m s	m s
0	−14 05.2	−14 09.6	−14 13.3
6	−14 06.3	−14 10.6	−14 14.1
12	−14 07.5	−14 11.6	−14 14.8
18	−14 08.6	−14 12.5	−14 15.5
24	−14 09.6	−14 13.3	−14 16.2

GCT of Transit Meridian of Greenwich

DAY	Moon	Venus	Mars	Jupiter	Saturn
	h m	h m	h m	h m	h m
6	12 28	13 34	13 51	13 53	3 09
7	13 18	13 35	13 50	13 50	3 05
8	14 05	13 36	13 49	13 47	3 01
9	14 49	13 36	13 48	13 44	2 56

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb	Venus	Mars
°	′	′	′
0			
	0.5	0.1	0.1
30			
	0.5	0.1	0.1
45			
	0.5	0.1	0.0
60			
	0.5	0.0	0.0
75			
	0.5	0.0	0.0
90			

Moon's Lower Limb
Add

Alt.	6	7	8
°	′	′	′
0			
	18.3	17.6	16.6
4			
	18.3	17.6	16.6
8			
	18.3	17.6	16.6
12			
	18.3	17.5	16.5
16			
	18.2	17.5	16.5
20			
	18.2	17.5	16.5
24			
	18.1	17.4	16.5
28			
	18.1	17.4	16.5
32			
	18.0	17.3	16.4
36			
	17.9	17.2	16.4
40			
	17.8	17.2	16.4
44			
	17.7	17.1	16.3
48			
	17.6	17.0	16.3
52			
	17.4	16.9	16.2
56			
	17.3	16.8	16.2
60			
	17.2	16.7	16.1
64			
	17.0	16.6	16.1
68			
	16.9	16.5	16.0
72			
	16.8	16.4	16.0
76			
	16.6	16.3	15.9
80			
	16.5	16.2	15.9
84			
	16.3	16.1	15.8
88			
	16.2	16.0	15.8
90			

Add to table, back cover

Moon's Upper Limb
Subtract

Alt.	6	7	8
°	′	′	′
0			
	14.0	14.4	15.0
4			
	14.0	14.4	15.0
8			
	14.0	14.4	15.0
12			
	14.0	14.4	15.0
16			
	14.1	14.5	15.0
20			
	14.1	14.5	15.0
24			
	14.2	14.5	15.0
28			
	14.2	14.6	15.1
32			
	14.3	14.7	15.1
36			
	14.4	14.7	15.1
40			
	14.5	14.8	15.2
44			
	14.6	14.9	15.2
48			
	14.7	15.0	15.3
52			
	14.9	15.0	15.3
56			
	15.0	15.1	15.3
60			
	15.1	15.2	15.4
64			
	15.3	15.3	15.4
68			
	15.4	15.4	15.5
72			
	15.5	15.5	15.5
76			
	15.7	15.7	15.6
80			
	15.8	15.8	15.7
84			
	16.0	15.9	15.7
88			
	16.1	16.0	15.8
90			

Subtract from table, back cover

New Moon 6
Ash Wednesday 7

GCT	♈	VENUS −3.3		MARS 1.4		JUPITER −1.6		SATURN 0.9		MOON			
	GHA	GHA	Dec.	GHA	Dec.	GHA	Dec.	GHA	Dec.	GHA	code	Dec.	code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
0	138 16.7	156 01.5	− 9 06.4	152 56.9	− 7 12.4	153 33.8	− 7 38.0	315 46.0	+ 1 34.2	144 20.4	142	− 2 11.4	+159
1	153 19.2	171 01.0	05.2	167 57.6	11.6	168 35.7	37.7	330 48.5	34.2	158 53.6	142	1 55.5	+159
2	168 21.6	186 00.6	04.0	182 58.2	10.8	183 37.6	37.5	345 51.1	34.3	173 26.8	143	1 39.6	+159
3	183 24.1	201 00.2	·· 02.8	197 58.9	·· 10.1	198 39.5	·· 37.3	0 53.7	·· 34.3	188 00.1	143	· 1 23.7	+159
4	198 26.5	215 59.7	01.5	212 59.5	09.3	213 41.5	37.1	15 56.2	34.4	202 33.4	143	1 07.8	+159
5	213 29.0	230 59.3	9 00.3	228 00.2	08.5	228 43.4	36.8	30 58.8	34.4	217 06.7	144	0 51.9	+158
6	228 31.5	245 58.9	− 8 59.1	243 00.8	− 7 07.7	243 45.3	− 7 36.6	46 01.4	+ 1 34.5	231 40.1	144	− 0 36.1	+158
7	243 33.9	260 58.4	57.9	258 01.5	06.9	258 47.2	36.4	61 04.0	34.6	246 13.5	145	0 20.3	+158
8	258 36.4	275 58.0	56.7	273 02.1	06.2	273 49.2	36.2	76 06.5	34.6	260 47.0	145	− 0 04.5	+158
9	273 38.9	290 57.5	·· 55.5	288 02.8	·· 05.4	288 51.1	·· 36.0	91 09.1	·· 34.7	275 20.5	146	+ 0 11.3	+158
10	288 41.3	305 57.1	54.2	303 03.4	04.6	303 53.0	35.7	106 11.7	34.7	289 54.1	145	0 27.1	+157
11	303 43.8	320 56.7	53.0	318 04.1	03.8	318 54.9	35.5	121 14.2	34.8	304 27.6	146	0 42.8	+157
12	318 46.3	335 56.2	− 8 51.8	333 04.8	− 7 03.1	333 56.8	− 7 35.3	136 16.8	+ 1 34.8	319 01.2	147	+ 0 58.5	+157
13	333 48.7	350 55.8	50.6	348 05.4	02.3	348 58.8	35.1	151 19.4	34.9	333 34.9	147	1 14.2	+157
14	348 51.2	5 55.4	49.4	3 06.1	01.5	4 00.7	34.8	166 21.9	35.0	348 08.6	147	1 29.9	+156
15	3 53.6	20 54.9	·· 48.2	18 06.7	·· 00.7	19 02.6	·· 34.6	181 24.5	·· 35.0	2 42.3	147	· 1 45.5	+156
16	18 56.1	35 54.5	46.9	33 07.4	7 00.0	34 04.5	34.4	196 27.1	35.1	17 16.0	147	2 01.1	+156
17	33 58.6	50 54.1	45.7	48 08.0	6 59.2	49 06.5	34.2	211 29.7	35.1	31 49.7	148	2 16.7	+156
18	49 01.0	65 53.6	− 8 44.5	63 08.7	− 6 58.4	64 08.4	− 7 33.9	226 32.2	+ 1 35.2	46 23.5	148	+ 2 32.3	+155
19	64 03.5	80 53.2	43.3	78 09.3	57.6	79 10.3	33.7	241 34.8	35.2	60 57.3	149	2 47.8	+155
20	79 06.0	95 52.8	42.1	93 10.0	56.9	94 12.2	33.5	256 37.4	35.3	75 31.2	148	3 03.3	+155
21	94 08.4	110 52.3	·· 40.8	108 10.6	·· 56.1	109 14.1	·· 33.3	271 39.9	·· 35.4	90 05.0	149	· 3 18.8	+154
22	109 10.9	125 51.9	39.6	123 11.3	55.3	124 16.1	33.0	286 42.5	35.4	104 38.9	149	3 34.2	+154
23	124 13.4	140 51.5	38.4	138 11.9	54.5	139 18.0	32.8	301 45.1	35.5	119 12.8	149	3 49.6	+154
0	139 15.8	155 51.0	− 8 37.2	153 12.6	− 6 53.7	154 19.9	− 7 32.6	316 47.7	+ 1 35.5	133 46.7	149	+ 4 05.0	+153
1	154 18.3	170 50.6	36.0	168 13.3	53.0	169 21.8	32.4	331 50.2	35.6	148 20.6	150	4 20.3	+153
2	169 20.8	185 50.2	34.7	183 13.9	52.2	184 23.8	32.1	346 52.8	35.6	162 54.6	149	4 35.6	+153
3	184 23.2	200 49.8	·· 33.5	198 14.6	·· 51.4	199 25.7	·· 31.9	1 55.4	·· 35.7	177 28.5	150	· 4 50.9	+152
4	199 25.7	215 49.3	32.3	213 15.2	50.6	214 27.6	31.7	16 58.0	35.8	192 02.5	150	5 06.1	+151
5	214 28.1	230 48.9	31.1	228 15.9	49.9	229 29.5	31.5	32 00.5	35.8	206 36.5	150	5 21.2	+152
6	229 30.6	245 48.5	− 8 29.8	243 16.5	− 6 49.1	244 31.4	− 7 31.2	47 03.1	+ 1 35.9	221 10.5	150	+ 5 36.4	+151
7	244 33.1	260 48.0	28.6	258 17.2	48.3	259 33.4	31.0	62 05.7	35.9	235 44.5	150	5 51.5	+150
8	259 35.5	275 47.6	27.4	273 17.8	47.5	274 35.3	30.8	77 08.2	36.0	250 18.5	151	6 06.5	+150
9	274 38.0	290 47.2	·· 26.2	288 18.5	·· 46.7	289 37.2	·· 30.6	92 10.8	·· 36.0	264 52.6	150	· 6 21.5	+150
10	289 40.5	305 46.8	24.9	303 19.2	46.0	304 39.1	30.3	107 13.4	36.1	279 26.6	150	6 36.5	+149
11	304 42.9	320 46.3	23.7	318 19.8	45.2	319 41.1	30.1	122 16.0	36.2	294 00.6	151	6 51.4	+149
12	319 45.4	335 45.9	− 8 22.5	333 20.5	− 6 44.4	334 43.0	− 7 29.9	137 18.5	+ 1 36.2	308 34.7	150	+ 7 06.3	+148
13	334 47.9	350 45.5	21.3	348 21.1	43.6	349 44.9	29.7	152 21.1	36.3	323 08.7	151	7 21.1	+148
14	349 50.3	5 45.1	20.0	3 21.8	42.8	4 46.8	29.4	167 23.7	36.3	337 42.8	150	7 35.9	+147
15	4 52.8	20 44.6	·· 18.8	18 22.4	·· 42.1	19 48.7	·· 29.2	182 26.3	·· 36.4	352 16.8	151	· 7 50.6	+147
16	19 55.2	35 44.2	17.6	33 23.1	41.3	34 50.7	29.0	197 28.8	36.5	6 50.9	150	8 05.3	+147
17	34 57.7	50 43.8	16.4	48 23.8	40.5	49 52.6	28.8	212 31.4	36.5	21 24.9	151	8 20.0	+145
18	50 00.2	65 43.4	− 8 15.1	63 24.4	− 6 39.7	64 54.5	− 7 28.5	227 34.0	+ 1 36.6	35 59.0	150	+ 8 34.5	+146
19	65 02.6	80 42.9	13.9	78 25.1	39.0	79 56.4	28.3	242 36.6	36.6	50 33.0	151	8 49.1	+145
20	80 05.1	95 42.5	12.7	93 25.7	38.2	94 58.3	28.1	257 39.1	36.7	65 07.1	150	9 03.6	+144
21	95 07.6	110 42.1	·· 11.4	108 26.4	·· 37.4	110 00.3	·· 27.9	272 41.7	·· 36.7	79 41.1	150	· 9 18.0	+144
22	110 10.0	125 41.7	10.2	123 27.0	36.6	125 02.2	27.6	287 44.3	36.8	94 15.1	151	9 32.4	+143
23	125 12.5	140 41.2	09.0	138 27.7	35.8	140 04.1	27.4	302 46.9	36.9	108 49.2	150	9 46.7	+142
0	140 15.0	155 40.8	− 8 07.7	153 28.4	− 6 35.1	155 06.0	− 7 27.2	317 49.4	+ 1 36.9	123 23.2	150	+10 00.9	+142
1	155 17.4	170 40.4	06.5	168 29.0	34.3	170 07.9	26.9	332 52.0	37.0	137 57.2	150	10 15.1	+142
2	170 19.9	185 40.0	05.3	183 29.7	33.5	185 09.9	26.7	347 54.6	37.0	152 31.2	150	10 29.3	+141
3	185 22.4	200 39.6	·· 04.1	198 30.3	·· 32.7	200 11.8	·· 26.5	2 57.2	·· 37.1	167 05.2	149	·10 43.4	+140
4	200 24.8	215 39.1	02.8	213 31.0	31.9	215 13.7	26.3	17 59.7	37.2	181 39.1	150	10 57.4	+140
5	215 27.3	230 38.7	01.6	228 31.6	31.2	230 15.6	26.0	33 02.3	37.2	196 13.1	149	11 11.4	+139
6	230 29.7	245 38.3	− 8 00.4	243 32.3	− 6 30.4	245 17.5	− 7 25.8	48 04.9	+ 1 37.3	210 47.0	150	+11 25.3	+139
7	245 32.2	260 37.9	7 59.1	258 33.0	29.6	260 19.5	25.6	63 07.5	37.3	225 21.0	149	11 39.2	+137
8	260 34.7	275 37.5	57.9	273 33.6	28.8	275 21.4	25.4	78 10.1	37.4	239 54.9	149	11 52.9	+138
9	275 37.1	290 37.0	·· 56.7	288 34.3	·· 28.0	290 23.3	·· 25.1	93 12.6	·· 37.4	254 28.8	148	·12 06.7	+136
10	290 39.6	305 36.6	55.4	303 34.9	27.3	305 25.2	24.9	108 15.2	37.5	269 02.6	149	12 20.3	+136
11	305 42.1	320 36.2	54.2	318 35.6	26.5	320 27.1	24.7	123 17.8	37.6	283 36.5	148	12 33.9	+136
12	320 44.5	335 35.8	− 7 52.9	333 36.3	− 6 25.7	335 29.1	− 7 24.5	138 20.4	+ 1 37.6	298 10.3	148	+12 47.5	+134
13	335 47.0	350 35.4	51.7	348 36.9	24.9	350 31.0	24.2	153 22.9	37.7	312 44.1	148	13 00.9	+134
14	350 49.5	5 35.0	50.5	3 37.6	24.1	5 32.9	24.0	168 25.5	37.7	327 17.9	148	13 14.3	+134
15	5 51.9	20 34.5	·· 49.2	18 38.2	·· 23.3	20 34.8	·· 23.8	183 28.1	·· 37.8	341 51.7	147	·13 27.7	+133
16	20 54.4	35 34.1	48.0	33 38.9	22.6	35 36.7	23.6	198 30.7	37.9	356 25.4	148	13 41.0	+132
17	35 56.9	50 33.7	46.8	48 39.6	21.8	50 38.7	23.3	213 33.2	37.9	10 59.2	146	13 54.2	+131
18	50 59.3	65 33.3	− 7 45.5	63 40.2	− 6 21.0	65 40.6	− 7 23.1	228 35.8	+ 1 38.0	25 32.8	147	+14 07.3	+131
19	66 01.8	80 32.9	44.3	78 40.9	20.2	80 42.5	22.9	243 38.4	38.0	40 06.5	147	14 20.4	+129
20	81 04.2	95 32.5	43.1	93 41.5	19.4	95 44.4	22.7	258 41.0	38.1	54 40.2	146	14 33.3	+130
21	96 06.7	110 32.0	·· 41.8	108 42.2	·· 18.7	110 46.3	·· 22.4	273 43.6	·· 38.2	69 13.8	145	·14 46.3	+128
22	111 09.2	125 31.6	40.6	123 42.9	17.9	125 48.3	22.2	288 46.1	38.2	83 47.3	146	14 59.1	+128
23	126 11.6	140 31.2	39.3	138 43.5	17.1	140 50.2	22.0	303 48.7	38.3	98 20.9	145	15 11.9	+127
24	141 14.1	155 30.8	− 7 38.1	153 44.2	− 6 16.3	155 52.1	− 7 21.7	318 51.3	+ 1 38.3	112 54.4	145	+15 24.6	+126
code	—	− 4	+ 12	+ 6	+ 8	+ 19	+ 2	+ 26	+ 1				

GCT	SUN GHA	SUN Dec.
h	° ′	° ′
0	176 25.9	−15 00.0
1	191 25.9	14 59.2
2	206 25.9	58.4
3	221 25.9	·· 57.6
4	236 25.8	56.9
5	251 25.8	56.1
6	266 25.8	−14 55.3
7	281 25.8	54.5
8	296 25.8	53.7
9	311 25.7	·· 52.9
10	326 25.7	52.1
11	341 25.7	51.3
12	356 25.7	−14 50.5
13	11 25.6	49.7
14	26 25.6	48.9
15	41 25.6	·· 48.1
16	56 25.6	47.3
17	71 25.6	46.5
18	86 25.5	−14 45.7
19	101 25.5	44.9
20	116 25.5	44.1
21	131 25.5	·· 43.3
22	146 25.5	42.5
23	161 25.5	41.7
0	176 25.4	−14 40.9
1	191 25.4	40.1
2	206 25.4	39.3
3	221 25.4	·· 38.5
4	236 25.4	37.7
5	251 25.4	36.9
6	266 25.3	−14 36.1
7	281 25.3	35.3
8	296 25.3	34.4
9	311 25.3	·· 33.6
10	326 25.3	32.8
11	341 25.3	32.0
12	356 25.3	−14 31.2
13	11 25.2	30.4
14	26 25.2	29.6
15	41 25.2	·· 28.8
16	56 25.2	28.0
17	71 25.2	27.2
18	86 25.2	−14 26.4
19	101 25.2	25.6
20	116 25.2	24.7
21	131 25.2	·· 23.9
22	146 25.1	23.1
23	161 25.1	22.3
0	176 25.1	−14 21.5
1	191 25.1	20.7
2	206 25.1	19.9
3	221 25.1	·· 19.1
4	236 25.1	18.2
5	251 25.1	17.4
6	266 25.1	−14 16.6
7	281 25.1	15.8
8	296 25.1	15.0
9	311 25.1	·· 14.2
10	326 25.1	13.3
11	341 25.0	12.5
12	356 25.0	−14 11.7
13	11 25.0	10.9
14	26 25.0	10.1
15	41 25.0	·· 09.3
16	56 25.0	08.4
17	71 25.0	07.6
18	86 25.0	−14 06.8
19	101 25.0	06.0
20	116 25.0	05.2
21	131 25.0	·· 04.3
22	146 25.0	03.5
23	161 25.0	02.7
24	176 25.0	−14 01.9
code	—	+ 8

STARS No.	SHA	Dec.	Transit Mer. Gr.
	° ′	° ′	h m
1	358 32.5	+28 49.3	14 46
2	358 22.3	+58 53.0	14 47
3	349 43.1	−18 15.4	15 22
4	339 21.5	+59 59.2	16 03
5	336 01.5	−57 29.3	16 16
6	332 51.1	+89 02.5	16 29
7	328 53.9	+23 14.1	16 45
8	315 53.8	−40 30.1	17 36
9	309 47.7	+49 41.6	18 01
10	291 43.2	+16 24.9	19 13
11	281 57.0	− 8 15.4	19 52
12	281 43.6	+45 57.3	19 53
13	279 22.2	+ 6 18.5	20 02
14	279 11.8	+28 34.3	20 03
15	276 33.8	− 1 13.8	20 13
16	271 51.9	+ 7 24.1	20 32
17	264 16.6	−52 40.2	21 02
18	259 14.8	−16 38.9	21 22
19	255 49.1	−28 54.3	21 36
20	245 48.5	+ 5 21.1	22 16
21	244 24.7	+28 08.8	22 22
22	234 36.8	−59 21.1	23 01
23	223 26.7	−43 14.1	23 45
24	221 49.3	−69 30.9	23 52
25	218 41.9	− 8 26.8	0 08
26	208 33.0	+12 12.3	0 49
27	194 48.1	+62 00.8	1 43
28	183 21.1	+14 50.6	2 29
29	174 01.7	−62 49.6	3 06
30	172 53.2	−56 50.3	3 11
31	168 47.1	−59 25.2	3 27
32	167 01.1	+56 13.2	3 34
33	159 30.1	+55 10.4	4 04
34	159 20.6	−10 54.5	4 05
35	153 35.4	+49 33.0	4 28
36	149 03.0	−36 07.8	4 46
37	146 38.4	+19 25.9	4 56
38	140 56.1	−60 38.1	5 18
39	137 17.1	+74 20.9	5 33
40	126 50.7	+26 52.3	6 15
41	120 38.5	−22 29.2	6 39
42	113 24.0	−26 19.6	7 08
43	109 08.3	−68 56.4	7 25
44	103 06.5	−15 40.1	7 49
45	97 25.9	−37 04.3	8 12
46	96 50.2	+12 35.3	8 14
47	91 08.3	+51 29.2	8 37
48	84 46.3	−34 24.7	9 02
49	81 11.1	+38 43.9	9 17
50	76 56.7	−26 21.7	9 34
51	62 54.3	+ 8 44.0	10 30
52	54 33.5	−56 53.7	11 03
53	50 04.1	+45 06.1	11 21
54	34 33.5	+ 9 38.8	12 23
55	28 42.8	−47 12.1	12 46
56	16 15.9	−29 53.1	13 36
57	14 25.4	+14 56.4	13 43

Lat.	Sunrise	Twlt. begins	Moonrise 9	Moonrise 10	Moonrise 11	Moonrise 12
N °	h m	h m	h m	h m	h m	h m
70	9 02	5 27	8 38	8 12	7 41	6 58
68	8 42	5 28	8 38	8 18	7 56	7 28
66	8 26	5 30	8 38	8 24	8 09	7 50
64	8 14	5 32	8 38	8 29	8 19	8 08
62	8 03	5 33	8 38	8 33	8 28	8 23
60	7 53	5 33	8 38	8 37	8 36	8 35
58	7 45	5 33	8 38	8 40	8 43	8 46
56	7 38	5 33	8 38	8 43	8 49	8 56
54	7 32	5 33	8 38	8 46	8 54	9 04
52	7 26	5 33	8 38	8 48	8 59	9 12
50	7 21	5 32	8 38	8 51	9 04	9 18
45	7 09	5 31	8 38	8 56	9 13	9 33
40	7 00	5 29	8 38	9 00	9 22	9 45
35	6 52	5 27	8 38	9 03	9 29	9 56
30	6 45	5 25	8 38	9 06	9 35	10 05
20	6 32	5 18	8 38	9 12	9 46	10 21
10	6 21	5 09	8 38	9 17	9 55	10 35
0	6 11	5 00	8 39	9 22	10 04	10 48
10	6 00	4 47	8 39	9 26	10 14	11 01
20	5 49	4 30	8 39	9 31	10 23	11 16
30	5 36	4 09	8 39	9 37	10 35	11 32
35	5 28	3 54	8 39	9 41	10 41	11 42
40	5 19	3 35	8 39	9 45	10 49	11 53
45	5 09	3 12	8 39	9 49	10 58	12 06
50	4 56	2 38	8 39	9 54	11 08	12 22
52	4 51	2 19	8 39	9 57	11 13	12 29
54	4 44	1 54	8 40	10 00	11 19	12 38
56	4 37	1 19	8 40	10 03	11 25	12 47
58	4 29	////	8 40	10 06	11 32	12 58
60	4 19	////	8 40	10 10	11 40	13 11
S						

Lat.	Sunset	Twlt. ends	Moonset 9	Moonset 10	Moonset 11	Moonset 12
N °	h m	h m	h m	h m	h m	h m
70	15 28	19 07	21 38	23 39	25 54	1 54
68	15 48	19 05	21 34	23 26	25 26	1 26
66	16 03	19 02	21 30	23 16	25 05	1 05
64	16 16	19 01	21 28	23 07	24 48	0 48
62	16 27	19 00	21 25	22 59	24 34	0 34
60	16 36	18 59	21 23	22 53	24 23	0 23
58	16 44	18 58	21 21	22 47	24 13	0 13
56	16 51	18 58	21 20	22 42	24 04	0 04
54	16 58	18 58	21 18	22 38	23 57	25 16
52	17 03	18 58	21 17	22 34	23 50	25 06
50	17 09	18 59	21 16	22 30	23 43	24 57
45	17 20	18 59	21 13	22 22	23 30	24 38
40	17 29	19 01	21 11	22 16	23 20	24 24
35	17 37	19 03	21 09	22 10	23 10	24 11
30	17 44	19 05	21 07	22 05	23 02	24 00
20	17 57	19 12	21 04	21 56	22 48	23 41
10	18 07	19 19	21 02	21 49	22 36	23 25
0	18 18	19 29	20 59	21 42	22 25	23 10
10	18 28	19 41	20 57	21 35	22 14	22 54
20	18 39	19 57	20 54	21 28	22 02	22 38
30	18 52	20 18	20 51	21 19	21 49	22 20
35	19 00	20 33	20 50	21 15	21 41	22 09
40	19 09	20 51	20 48	21 09	21 32	21 57
45	19 19	21 15	20 46	21 03	21 22	21 43
50	19 31	21 47	20 43	20 56	21 09	21 26
52	19 37	22 05	20 42	20 52	21 03	21 17
54	19 43	22 28	20 40	20 48	20 57	21 08
56	19 50	23 01	20 39	20 44	20 50	20 58
58	19 58	////	20 37	20 40	20 42	20 47
60	20 08	////	20 36	20 34	20 33	20 33
S						

GCT	Equation of Time (App.—Mean) 9	10	11
h	m s	m s	m s
0	−14 16.2	−14 18.2	−14 19.5
6	−14 16.8	−14 18.6	−14 19.7
12	−14 17.3	−14 19.0	−14 19.8
18	−14 17.8	−14 19.2	−14 19.9
24	−14 18.2	−14 19.5	−14 20.0

GCT of Transit Meridian of Greenwich

DAY	Moon	Venus	Mars	Jupiter	Saturn
	h m	h m	h m	h m	h m
9	14 49	13 36	13 48	13 44	2 56
10	15 32	13 37	13 47	13 41	2 52
11	16 15	13 38	13 46	13 38	2 48
12	16 59	13 38	13 44	13 35	2 44

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb	Venus	Mars
°	′	′	′
0			
	0.5	0.1	0.1
30			
	0.5	0.1	0.1
45			
	0.5	0.1	0.0
60			
	0.5	0.0	0.0
75			
	0.5	0.0	0.0
90			

Moon's Lower Limb
Add

Alt.	9	10	11
°	′	′	′
0			
	15.6	14.5	13.6
4			
	15.6	14.5	13.7
8			
	15.6	14.5	13.7
12			
	15.6	14.6	13.7
16			
	15.6	14.6	13.7
20			
	15.6	14.6	13.8
24			
	15.6	14.6	13.8
28			
	15.6	14.6	13.8
32			
	15.6	14.7	13.9
36			
	15.6	14.7	14.0
40			
	15.6	14.7	14.0
44			
	15.6	14.8	14.1
48			
	15.6	14.8	14.2
52			
	15.6	14.9	14.3
56			
	15.6	14.9	14.3
60			
	15.6	15.0	14.4
64			
	15.6	15.0	14.5
68			
	15.6	15.1	14.6
72			
	15.6	15.1	14.7
76			
	15.6	15.2	14.8
80			
	15.6	15.2	14.9
84			
	15.6	15.3	15.0
88			
	15.6	15.3	15.1
90			

Add to table, back cover

Moon's Upper Limb
Subtract

Alt.	9	10	11
°	′	′	′
0			
	15.6	16.1	16.6
4			
	15.6	16.1	16.6
8			
	15.6	16.1	16.6
12			
	15.6	16.1	16.6
16			
	15.6	16.1	16.6
20			
	15.6	16.1	16.5
24			
	15.6	16.1	16.5
28			
	15.6	16.0	16.4
32			
	15.6	16.0	16.4
36			
	15.6	16.0	16.3
40			
	15.6	15.9	16.3
44			
	15.6	15.9	16.2
48			
	15.6	15.8	16.1
52			
	15.6	15.8	16.0
56			
	15.6	15.8	15.9
60			
	15.6	15.7	15.8
64			
	15.6	15.7	15.8
68			
	15.6	15.6	15.7
72			
	15.6	15.6	15.6
76			
	15.6	15.5	15.5
80			
	15.6	15.4	15.4
84			
	15.6	15.4	15.2
88			
	15.6	15.3	15.2
90			

Subtract from table, back cover

GCT	♈	VENUS −3.3		MARS 1.4		JUPITER −1.6		SATURN 0.9		MOON			
	GHA	GHA	Dec.	GHA	Dec.	GHA	Dec.	GHA	Dec.	GHA	code	Dec.	code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
0	141 14.1	155 30.8	− 7 38.1	153 44.2	− 6 16.3	155 52.1	− 7 21.7	318 51.3	+ 1 38.3	112 54.4	145	+15 24.6	+126
1	156 16.6	170 30.4	36.9	168 44.8	15.5	170 54.0	21.5	333 53.9	38.4	127 27.9	145	15 37.2	+126
2	171 19.0	185 30.0	35.6	183 45.5	14.8	185 55.9	21.3	348 56.5	38.5	142 01.4	144	15 49.8	+125
3	186 21.5	200 29.6	·· 34.4	198 46.2	·· 14.0	200 57.9	·· 21.1	3 59.0	·· 38.5	156 34.8	144	·16 02.3	+124
4	201 24.0	215 29.2	33.1	213 46.8	13.2	215 59.8	20.8	19 01.6	38.6	171 08.2	143	16 14.7	+123
5	216 26.4	230 28.7	31.9	228 47.5	12.4	231 01.7	20.6	34 04.2	38.6	185 41.5	143	16 27.0	+122
6	231 28.9	245 28.3	− 7 30.7	243 48.1	− 6 11.6	246 03.6	− 7 20.4	49 06.8	+ 1 38.7	200 14.8	143	+16 39.2	+122
7	246 31.3	260 27.9	29.4	258 48.8	10.8	261 05.5	20.2	64 09.4	38.8	214 48.1	142	16 51.4	+121
8	261 33.8	275 27.5	28.2	273 49.5	10.1	276 07.5	19.9	79 11.9	38.8	229 21.3	142	17 03.5	+120
9	276 36.3	290 27.1	·· 26.9	288 50.1	·· 09.3	291 09.4	·· 19.7	94 14.5	·· 38.9	243 54.5	142	·17 15.5	+119
10	291 38.7	305 26.7	25.7	303 50.8	08.5	306 11.3	19.5	109 17.1	38.9	258 27.7	141	17 27.4	+119
11	306 41.2	320 26.3	24.4	318 51.5	07.7	321 13.2	19.3	124 19.7	39.0	273 00.8	141	17 39.3	+117
12	321 43.7	335 25.9	− 7 23.2	333 52.1	− 6 06.9	336 15.1	− 7 19.0	139 22.3	+ 1 39.1	287 33.9	141	+17 51.0	+117
13	336 46.1	350 25.5	22.0	348 52.8	06.2	351 17.1	18.8	154 24.8	39.1	302 07.0	140	18 02.7	+116
14	351 48.6	5 25.1	20.7	3 53.4	05.4	6 19.0	18.6	169 27.4	39.2	316 40.0	139	18 14.3	+115
15	6 51.1	20 24.7	·· 19.5	18 54.1	·· 04.6	21 20.9	·· 18.3	184 30.0	·· 39.2	331 12.9	139	·18 25.8	+115
16	21 53.5	35 24.2	18.2	33 54.8	03.8	36 22.8	18.1	199 32.6	39.3	345 45.8	139	18 37.3	+113
17	36 56.0	50 23.8	17.0	48 55.4	03.0	51 24.7	17.9	214 35.2	39.4	0 18.7	138	18 48.6	+113
18	51 58.5	65 23.4	− 7 15.7	63 56.1	− 6 02.2	66 26.7	− 7 17.7	229 37.7	+ 1 39.4	14 51.5	138	+18 59.9	+111
19	67 00.9	80 23.0	14.5	78 56.8	01.5	81 28.6	17.4	244 40.3	39.5	29 24.3	138	19 11.0	+111
20	82 03.4	95 22.6	13.2	93 57.4	6 00.7	96 30.5	17.2	259 42.9	39.6	43 57.1	137	19 22.1	+110
21	97 05.8	110 22.2	·· 12.0	108 58.1	· 5 59.9	111 32.4	·· 17.0	274 45.5	·· 39.6	58 29.8	136	·19 33.1	+109
22	112 08.3	125 21.8	10.8	123 58.7	59.1	126 34.3	16.8	289 48.1	39.7	73 02.4	136	19 44.0	+108
23	127 10.8	140 21.4	09.5	138 59.4	58.3	141 36.2	16.5	304 50.7	39.7	87 35.0	136	19 54.8	+108
0	142 13.2	155 21.0	− 7 08.3	154 00.1	− 5 57.5	156 38.2	− 7 16.3	319 53.2	+ 1 39.8	102 07.6	135	+20 05.6	+106
1	157 15.7	170 20.6	07.0	169 00.7	56.8	171 40.1	16.1	334 55.8	39.9	116 40.1	134	20 16.2	+106
2	172 18.2	185 20.2	05.8	184 01.4	56.0	186 42.0	15.9	349 58.4	39.9	131 12.5	134	20 26.8	+104
3	187 20.6	200 19.8	·· 04.5	199 02.1	·· 55.2	201 43.9	·· 15.6	5 01.0	·· 40.0	145 44.9	134	·20 37.2	+104
4	202 23.1	215 19.4	03.3	214 02.7	54.4	216 45.8	15.4	20 03.6	40.0	160 17.3	133	20 47.6	+102
5	217 25.6	230 19.0	02.0	229 03.4	53.6	231 47.8	15.2	35 06.1	40.1	174 49.6	132	20 57.8	+102
6	232 28.0	245 18.6	− 7 00.8	244 04.1	− 5 52.8	246 49.7	− 7 14.9	50 08.7	+ 1 40.2	189 21.8	132	+21 08.0	+101
7	247 30.5	260 18.2	6 59.5	259 04.7	52.1	261 51.6	14.7	65 11.3	40.2	203 54.0	132	21 18.1	+ 99
8	262 33.0	275 17.8	58.3	274 05.4	51.3	276 53.5	14.5	80 13.9	40.3	218 26.2	131	21 28.0	+ 99
9	277 35.4	290 17.4	·· 57.0	289 06.1	·· 50.5	291 55.4	·· 14.3	95 16.5	·· 40.4	232 58.3	131	·21 37.9	+ 98
10	292 37.9	305 17.0	55.8	304 06.7	49.7	306 57.3	14.0	110 19.1	40.4	247 30.4	130	21 47.7	+ 97
11	307 40.3	320 16.6	54.5	319 07.4	48.9	321 59.3	13.8	125 21.6	40.5	262 02.4	129	21 57.4	+ 96
12	322 42.8	335 16.2	− 6 53.3	334 08.0	− 5 48.1	337 01.2	− 7 13.6	140 24.2	+ 1 40.5	276 34.3	129	+22 07.0	+ 95
13	337 45.3	350 15.8	52.0	349 08.7	47.3	352 03.1	13.4	155 26.8	40.6	291 06.2	128	22 16.5	+ 93
14	352 47.7	5 15.4	50.8	4 09.4	46.6	7 05.0	13.1	170 29.4	40.7	305 38.0	128	22 25.8	+ 93
15	7 50.2	20 15.0	·· 49.5	19 10.0	·· 45.8	22 06.9	·· 12.9	185 32.0	·· 40.7	320 09.8	128	·22 35.1	+ 92
16	22 52.7	35 14.6	48.3	34 10.7	45.0	37 08.8	12.7	200 34.6	40.8	334 41.6	126	22 44.3	+ 91
17	37 55.1	50 14.2	47.0	49 11.4	44.2	52 10.8	12.4	215 37.2	40.8	349 13.2	127	22 53.4	+ 90
18	52 57.6	65 13.8	− 6 45.8	64 12.0	− 5 43.4	67 12.7	− 7 12.2	230 39.7	+ 1 40.9	3 44.9	125	+23 02.4	+ 88
19	68 00.1	80 13.4	44.5	79 12.7	42.6	82 14.6	12.0	245 42.3	41.0	18 16.4	125	23 11.2	+ 88
20	83 02.5	95 13.0	43.3	94 13.4	41.9	97 16.5	11.8	260 44.9	41.0	32 47.9	125	23 20.0	+ 87
21	98 05.0	110 12.6	·· 42.0	109 14.0	·· 41.1	112 18.4	·· 11.5	275 47.5	·· 41.1	47 19.4	124	·23 28.7	+ 85
22	113 07.4	125 12.2	40.7	124 14.7	40.3	127 20.4	11.3	290 50.1	41.2	61 50.8	124	23 37.2	+ 85
23	128 09.9	140 11.8	39.5	139 15.4	39.5	142 22.3	11.1	305 52.7	41.2	76 22.2	123	23 45.7	+ 83
0	143 12.4	155 11.4	− 6 38.2	154 16.0	− 5 38.7	157 24.2	− 7 10.8	320 55.2	+ 1 41.3	90 53.5	122	+23 54.0	+ 83
1	158 14.8	170 11.0	37.0	169 16.7	37.9	172 26.1	10.6	335 57.8	41.3	105 24.7	122	24 02.3	+ 81
2	173 17.3	185 10.6	35.7	184 17.4	37.1	187 28.0	10.4	351 00.4	41.4	119 55.9	121	24 10.4	+ 80
3	188 19.8	200 10.2	·· 34.5	199 18.0	·· 36.4	202 29.9	·· 10.2	6 03.0	·· 41.5	134 27.0	121	·24 18.4	+ 79
4	203 22.2	215 09.8	33.2	214 18.7	35.6	217 31.9	09.9	21 05.6	41.5	148 58.1	120	24 26.3	+ 78
5	218 24.7	230 09.4	32.0	229 19.4	34.8	232 33.8	09.7	36 08.2	41.6	163 29.1	120	24 34.1	+ 77
6	233 27.2	245 09.0	− 6 30.7	244 20.0	− 5 34.0	247 35.7	− 7 09.5	51 10.8	+ 1 41.7	178 00.1	119	+24 41.8	+ 76
7	248 29.6	260 08.6	29.4	259 20.7	33.2	262 37.6	09.3	66 13.3	41.7	192 31.0	118	24 49.4	+ 74
8	263 32.1	275 08.2	28.2	274 21.4	32.4	277 39.5	09.0	81 15.9	41.8	207 01.8	118	24 56.8	+ 74
9	278 34.6	290 07.8	·· 26.9	289 22.0	·· 31.7	292 41.4	·· 08.8	96 18.5	·· 41.8	221 32.6	118	·25 04.2	+ 72
10	293 37.0	305 07.4	25.7	304 22.7	30.9	307 43.4	08.6	111 21.1	41.9	236 03.4	117	25 11.4	+ 71
11	308 39.5	320 07.0	24.4	319 23.4	30.1	322 45.3	08.3	126 23.7	42.0	250 34.1	116	25 18.5	+ 70
12	323 41.9	335 06.6	− 6 23.2	334 24.1	− 5 29.3	337 47.2	− 7 08.1	141 26.3	+ 1 42.0	265 04.7	116	+25 25.5	+ 69
13	338 44.4	350 06.2	21.9	349 24.7	28.5	352 49.1	07.9	156 28.9	42.1	279 35.3	115	25 32.4	+ 68
14	353 46.9	5 05.8	20.6	4 25.4	27.7	7 51.0	07.7	171 31.5	42.2	294 05.8	115	25 39.2	+ 67
15	8 49.3	20 05.5	·· 19.4	19 26.1	·· 26.9	22 52.9	·· 07.4	186 34.0	·· 42.2	308 36.3	114	·25 45.9	+ 65
16	23 51.8	35 05.1	18.1	34 26.7	26.2	37 54.9	07.2	201 36.6	42.3	323 06.7	114	25 52.4	+ 64
17	38 54.3	50 04.7	16.9	49 27.4	25.4	52 56.8	07.0	216 39.2	42.3	337 37.1	113	25 58.8	+ 63
18	53 56.7	65 04.3	− 6 15.6	64 28.1	− 5 24.6	67 58.7	− 7 06.7	231 41.8	+ 1 42.4	352 07.4	113	+26 05.1	+ 62
19	68 59.2	80 03.9	14.3	79 28.7	23.8	83 00.6	06.5	246 44.4	42.5	6 37.7	112	26 11.3	+ 60
20	84 01.7	95 03.5	13.1	94 29.4	23.0	98 02.5	06.3	261 47.0	42.5	21 07.9	111	26 17.3	+ 60
21	99 04.1	110 03.1	·· 11.8	109 30.1	·· 22.2	113 04.4	·· 06.1	276 49.6	·· 42.6	35 38.0	111	·26 23.3	+ 58
22	114 06.6	125 02.7	10.6	124 30.7	21.4	128 06.4	05.8	291 52.2	42.7	50 08.1	111	26 29.1	+ 57
23	129 09.1	140 02.3	09.3	139 31.4	20.6	143 08.3	05.6	306 54.7	42.7	64 38.2	110	26 34.8	+ 56
24	144 11.5	155 01.9	− 6 08.0	154 32.1	− 5 19.9	158 10.2	− 7 05.4	321 57.3	+ 1 42.8	79 08.2	109	+26 40.4	+ 54
code	—	− 4	+ 13	+ 7	+ 8	+ 19	+ 2	+ 26	+ 1				

SUN

GCT (h)	GHA (° ′)	Dec. (° ′)
0	176 25.0	−14 01.9
1	191 25.0	01.1
2	206 25.0	14 00.2
3	221 25.0	·13 59.4
4	236 25.0	58.6
5	251 25.0	57.8
6	266 25.0	−13 56.9
7	281 25.0	56.1
8	296 25.0	55.3
9	311 25.0	•• 54.5
10	326 25.0	53.6
11	341 25.0	52.8
12	356 25.0	−13 52.0
13	11 25.0	51.1
14	26 25.0	50.3
15	41 25.0	•• 49.5
16	56 25.0	48.7
17	71 25.1	47.8
18	86 25.1	−13 47.0
19	101 25.1	46.2
20	116 25.1	45.3
21	131 25.1	•• 44.5
22	146 25.1	43.7
23	161 25.1	42.9
0	176 25.1	−13 42.0
1	191 25.1	41.2
2	206 25.1	40.4
3	221 25.1	•• 39.5
4	236 25.1	38.7
5	251 25.1	37.9
6	266 25.1	−13 37.0
7	281 25.2	36.2
8	296 25.2	35.4
9	311 25.2	•• 34.5
10	326 25.2	33.7
11	341 25.2	32.8
12	356 25.2	−13 32.0
13	11 25.2	31.2
14	26 25.2	30.3
15	41 25.2	•• 29.5
16	56 25.3	28.7
17	71 25.3	27.8
18	86 25.3	−13 27.0
19	101 25.3	26.1
20	116 25.3	25.3
21	131 25.3	•• 24.5
22	146 25.3	23.6
23	161 25.4	22.8
0	176 25.4	−13 21.9
1	191 25.4	21.1
2	206 25.4	20.3
3	221 25.4	•• 19.4
4	236 25.4	18.6
5	251 25.5	17.7
6	266 25.5	−13 16.9
7	281 25.5	16.0
8	296 25.5	15.2
9	311 25.5	•• 14.4
10	326 25.5	13.5
11	341 25.6	12.7
12	356 25.6	−13 11.8
13	11 25.6	11.0
14	26 25.6	10.1
15	41 25.6	•• 09.3
16	56 25.7	08.4
17	71 25.7	07.6
18	86 25.7	−13 06.7
19	101 25.7	05.9
20	116 25.7	05.0
21	131 25.8	•• 04.2
22	146 25.8	03.3
23	161 25.8	02.5
24	176 25.8	−13 01.6
code	—	+ 8

STARS

No.	SHA (° ′)	Dec. (° ′)	Transit Mer. Gr. (h m)
1	358 32.5	+28 49.3	14 35
2	358 22.3	+58 53.0	14 35
3	349 43.1	−18 15.4	15 10
4	339 21.5	+59 59.2	15 51
5	336 01.6	−57 29.3	16 04
6	332 52.0	+89 02.4	16 17
7	328 53.9	+23 14.1	16 33
8	315 53.8	−40 30.1	17 25
9	309 47.7	+49 41.6	17 49
10	291 43.2	+16 24.9	19 01
11	281 57.0	− 8 15.4	19 40
12	281 43.6	+45 57.3	19 41
13	279 22.2	+ 6 18.5	19 50
14	279 11.8	+28 34.3	19 51
15	276 33.8	− 1 13.9	20 02
16	271 51.9	+ 7 24.1	20 20
17	264 16.6	−52 40.2	20 51
18	259 14.8	−16 38.9	21 11
19	255 49.1	−28 54.3	21 24
20	245 48.5	+ 5 21.1	22 04
21	244 24.7	+28 08.9	22 10
22	234 36.8	−59 21.1	22 49
23	223 26.7	−43 14.1	23 33
24	221 49.3	−69 30.9	23 40
25	218 41.9	− 8 26.8	23 52
26	208 33.0	+12 12.3	0 37
27	194 48.1	+62 00.8	1 32
28	183 21.1	+14 50.5	2 17
29	174 01.7	−62 49.6	2 55
30	172 53.1	−56 50.3	2 59
31	168 47.0	−59 25.2	3 15
32	167 01.1	+56 13.2	3 22
33	159 30.1	+55 10.4	3 52
34	159 20.6	−10 54.5	3 53
35	153 35.3	+49 33.0	4 16
36	149 02.9	−36 07.8	4 34
37	146 38.3	+19 25.9	4 44
38	140 56.0	−60 38.1	5 07
39	137 17.1	+74 20.9	5 21
40	126 50.7	+26 52.3	6 03
41	120 38.4	−22 29.2	6 27
42	113 24.0	−26 19.6	6 56
43	109 08.2	−68 56.4	7 13
44	103 06.5	−15 40.1	7 37
45	97 25.8	−37 04.3	8 00
46	96 50.2	+12 35.3	8 02
47	91 08.2	+51 29.2	8 25
48	84 46.3	−34 24.7	8 51
49	81 11.0	+38 43.9	9 05
50	76 56.7	−26 21.7	9 22
51	62 54.3	+ 8 44.0	10 18
52	54 33.4	−56 53.7	10 51
53	50 04.0	+45 06.1	11 09
54	34 33.5	+ 9 38.8	12 11
55	28 42.8	−47 12.1	12 34
56	16 15.9	−29 53.1	13 24
57	14 25.4	+14 56.4	13 31

Sunrise, Twilight, Moonrise

Lat.	Sunrise	Twlt. begins	Moonrise 12	13	14	15
N °	h m	h m	h m	h m	h m	h m
70	8 47	5 16	6 58	▭	▭	▭
68	8 29	5 19	7 28	6 31	▭	▭
66	8 15	5 21	7 50	7 21	▭	▭
64	8 04	5 23	8 08	7 53	7 26	▭
62	7 54	5 25	8 23	8 17	8 10	7 57
60	7 46	5 26	8 35	8 36	8 39	8 48
58	7 38	5 27	8 46	8 52	9 01	9 19
56	7 32	5 28	8 56	9 05	9 20	9 43
54	7 26	5 28	9 04	9 17	9 35	10 02
52	7 20	5 28	9 12	9 27	9 48	10 18
50	7 16	5 28	9 18	9 37	10 00	10 32
45	7 05	5 28	9 33	9 56	10 25	11 01
40	6 56	5 27	9 45	10 12	10 44	11 23
35	6 49	5 25	9 56	10 26	11 01	11 42
30	6 42	5 22	10 05	10 38	11 15	11 58
20	6 31	5 16	10 21	10 59	11 40	12 25
10	6 21	5 10	10 35	11 16	12 01	12 49
0	6 11	5 00	10 48	11 33	12 21	13 11
10	6 01	4 49	11 01	11 50	12 41	13 33
20	5 50	4 33	11 16	12 09	13 02	13 56
30	5 38	4 11	11 32	12 30	13 27	14 24
35	5 31	3 58	11 42	12 42	13 42	14 40
40	5 23	3 41	11 53	12 56	13 59	15 00
45	5 13	3 18	12 06	13 14	14 20	15 23
50	5 02	2 46	12 22	13 35	14 46	15 53
52	4 56	2 30	12 29	13 45	14 59	16 08
54	4 50	2 08	12 38	13 57	15 14	16 25
56	4 44	1 40	12 47	14 10	15 31	16 46
58	4 36	0 47	12 58	14 25	15 52	17 12
60	4 28	////	13 11	14 44	16 19	17 49
S						

Sunset, Twilight, Moonset

Lat.	Sunset	Twlt. ends	Moonset 12	13	14	15
N °	h m	h m	h m	h m	h m	h m
70	15 43	19 18	1 54	▭	▭	▭
68	16 00	19 14	1 26	3 55	▭	▭
66	16 14	19 11	1 05	3 07	▭	▭
64	16 26	19 09	0 48	2 36	4 40	▭
62	16 36	19 08	0 34	2 13	3 57	5 52
60	16 44	19 06	0 23	1 55	3 29	5 02
58	16 51	19 04	0 13	1 40	3 07	4 31
56	16 58	19 04	0 04	1 27	2 49	4 07
54	17 04	19 04	25 16	1 16	2 34	3 48
52	17 09	19 03	25 06	1 06	2 21	3 32
50	17 14	19 03	24 57	0 57	2 09	3 19
45	17 24	19 03	24 38	0 38	1 46	2 51
40	17 33	19 04	24 24	0 24	1 27	2 29
35	17 40	19 05	24 11	0 11	1 11	2 10
30	17 47	19 08	24 00	0 00	0 58	1 55
20	17 58	19 12	23 41	24 34	0 34	1 28
10	18 08	19 19	23 25	24 15	0 15	1 06
0	18 18	19 29	23 10	23 56	24 44	0 44
10	18 27	19 39	22 54	23 37	24 23	0 23
20	18 38	19 55	22 38	23 18	24 01	0 01
30	18 50	20 15	22 20	22 55	23 35	24 20
35	18 57	20 29	22 09	22 42	23 19	24 04
40	19 05	20 46	21 57	22 26	23 02	23 44
45	19 14	21 07	21 43	22 08	22 40	23 20
50	19 26	21 38	21 26	21 46	22 13	22 50
52	19 31	21 54	21 17	21 35	22 00	22 35
54	19 37	22 15	21 08	21 23	21 45	22 18
56	19 43	22 41	20 58	21 09	21 27	21 57
58	19 51	23 27	20 47	20 53	21 06	21 30
60	19 59	////	20 33	20 34	20 39	20 52
S						

Equation of Time (App.—Mean)

GCT (h)	12 (m s)	13 (m s)	14 (m s)
0	−14 20.0	−14 19.7	−14 18.6
6	−14 20.0	−14 19.4	−14 18.2
12	−14 19.9	−14 19.2	−14 17.7
18	−14 19.8	−14 18.9	−14 17.2
24	−14 19.7	−14 18.6	−14 16.7

GCT of Transit Meridian of Greenwich

DAY	Moon (h m)	Venus (h m)	Mars (h m)	Jupiter (h m)	Saturn (h m)
12	16 59	13 38	13 44	13 35	2 44
13	17 45	13 39	13 43	13 32	2 40
14	18 33	13 40	13 42	13 29	2 36
15	19 23	13 40	13 41	13 26	2 32

ADDITIONAL ALTITUDE CORRECTIONS

Alt. °	Sun's Low'r Limb ′	Venus ′	Mars ′
0	0.5	0.1	0.1
30	0.5	0.1	0.1
45	0.5	0.1	0.0
60	0.5	0.0	0.0
75	0.5	0.0	0.0
90			

Moon's Lower Limb

Add

Alt. °	12 ′	13 ′	14 ′
0	12.9	12.4	12.1
4	12.9	12.4	12.1
8	12.9	12.4	12.2
12	12.9	12.4	12.2
16	13.0	12.5	12.2
20	13.0	12.6	12.3
24	13.1	12.6	12.4
28	13.2	12.7	12.5
32	13.2	12.8	12.6
36	13.3	12.9	12.7
40	13.4	13.0	12.8
44	13.5	13.1	12.9
48	13.6	13.3	13.1
52	13.7	13.4	13.2
56	13.9	13.5	13.4
60	14.0	13.7	13.5
64	14.1	13.9	13.7
68	14.3	14.0	13.9
72	14.4	14.2	14.1
76	14.5	14.4	14.3
80	14.7	14.5	14.4
84	14.8	14.7	14.6
88	14.9	14.8	14.8
90			

Add to table, back cover

Moon's Upper Limb

Subtract

Alt. °	12 ′	13 ′	14 ′
0	17.1	17.4	17.5
4	17.1	17.4	17.5
8	17.0	17.3	17.5
12	17.0	17.3	17.4
16	17.0	17.2	17.4
20	16.9	17.2	17.3
24	16.9	17.1	17.2
28	16.8	17.0	17.2
32	16.7	16.9	17.1
36	16.6	16.8	16.9
40	16.5	16.7	16.8
44	16.4	16.6	16.7
48	16.3	16.5	16.6
52	16.2	16.3	16.4
56	16.1	16.2	16.2
60	16.0	16.0	16.1
64	15.8	15.9	15.9
68	15.7	15.7	15.7
72	15.6	15.6	15.6
76	15.4	15.4	15.4
80	15.3	15.2	15.2
84	15.1	15.0	15.0
88	15.0	14.9	14.9
90			

Subtract from table, back cover

Lincoln's Birthday 12
First Quarter 13

833190°—50——3

GCT	♈ GHA	VENUS −3.3 GHA	Dec.	MARS 1.4 GHA	Dec.	JUPITER −1.6 GHA	Dec.	SATURN 0.9 GHA	Dec.	MOON GHA	code	Dec.	code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
0	144 11.5	155 01.9	− 6 08.0	154 32.1	− 5 19.9	158 10.2	− 7 05.4	321 57.3	+ 1 42.8	79 08.2	109	+26 40.4	+ 54
1	159 14.0	170 01.5	06.8	169 32.7	19.1	173 12.1	05.1	336 59.9	42.9	93 38.1	110	26 45.8	+ 53
2	174 16.4	185 01.2	05.5	184 33.4	18.3	188 14.0	04.9	352 02.5	42.9	108 08.1	108	26 51.1	+ 52
3	189 18.9	200 00.8	·· 04.3	199 34.1	·· 17.5	203 15.9	·· 04.7	7 05.1	·· 43.0	122 37.9	108	·26 56.3	+ 51
4	204 21.4	215 00.4	03.0	214 34.8	16.7	218 17.9	04.5	22 07.7	43.0	137 07.7	108	27 01.4	+ 49
5	219 23.8	230 00.0	01.7	229 35.4	15.9	233 19.8	04.2	37 10.3	43.1	151 37.5	107	27 06.3	+ 49
6	234 26.3	244 59.6	− 6 00.5	244 36.1	− 5 15.1	248 21.7	− 7 04.0	52 12.9	+ 1 43.2	166 07.2	107	+27 11.2	+ 47
7	249 28.8	259 59.2	5 59.2	259 36.8	14.4	263 23.6	03.8	67 15.5	43.2	180 36.9	106	27 15.9	+ 45
8	264 31.2	274 58.8	57.9	274 37.4	13.6	278 25.5	03.5	82 18.0	43.3	195 06.5	105	27 20.4	+ 45
9	279 33.7	289 58.4	·· 56.7	289 38.1	·· 12.8	293 27.4	·· 03.3	97 20.6	·· 43.4	209 36.0	106	·27 24.9	+ 43
10	294 36.2	304 58.0	55.4	304 38.8	12.0	308 29.3	03.1	112 23.2	43.4	224 05.6	105	27 29.2	+ 42
11	309 38.6	319 57.7	54.1	319 39.4	11.2	323 31.3	02.9	127 25.8	43.5	238 35.1	104	27 33.4	+ 40
12	324 41.1	334 57.3	− 5 52.9	334 40.1	− 5 10.4	338 33.2	− 7 02.6	142 28.4	+ 1 43.6	253 04.5	104	+27 37.4	+ 39
13	339 43.6	349 56.9	51.6	349 40.8	09.6	353 35.1	02.4	157 31.0	43.6	267 33.9	104	27 41.3	+ 38
14	354 46.0	4 56.5	50.4	4 41.5	08.8	8 37.0	02.2	172 33.6	43.7	282 03.3	103	27 45.1	+ 37
15	9 48.5	19 56.1	·· 49.1	19 42.1	·· 08.1	23 38.9	·· 01.9	187 36.2	·· 43.8	296 32.6	102	·27 48.8	+ 35
16	24 50.9	34 55.7	47.8	34 42.8	07.3	38 40.8	01.7	202 38.8	43.8	311 01.8	103	27 52.3	+ 34
17	39 53.4	49 55.4	46.6	49 43.5	06.5	53 42.8	01.5	217 41.4	43.9	325 31.1	102	27 55.7	+ 33
18	54 55.9	64 55.0	− 5 45.3	64 44.2	− 5 05.7	68 44.7	− 7 01.3	232 43.9	+ 1 43.9	340 00.3	101	+27 59.0	+ 31
19	69 58.3	79 54.6	44.0	79 44.8	04.9	83 46.6	01.0	247 46.5	44.0	354 29.4	102	28 02.1	+ 30
20	85 00.8	94 54.2	42.8	94 45.5	04.1	98 48.5	00.8	262 49.1	44.1	8 58.6	100	28 05.1	+ 28
21	100 03.3	109 53.8	·· 41.5	109 46.2	·· 03.3	113 50.4	·· 00.6	277 51.7	·· 44.1	23 27.6	101	·28 07.9	+ 28
22	115 05.7	124 53.4	40.2	124 46.8	02.5	128 52.3	00.3	292 54.3	44.2	37 56.7	100	28 10.7	+ 26
23	130 08.2	139 53.0	39.0	139 47.5	01.8	143 54.2	7 00.1	307 56.9	44.3	52 25.7	100	28 13.3	+ 24
0	145 10.7	154 52.7	− 5 37.7	154 48.2	− 5 01.0	158 56.2	− 6 59.9	322 59.5	+ 1 44.3	66 54.7	99	+28 15.7	+ 23
1	160 13.1	169 52.3	36.4	169 48.9	5 00.2	173 58.1	59.7	338 02.1	44.4	81 23.6	100	28 18.0	+ 22
2	175 15.6	184 51.9	35.1	184 49.5	4 59.4	189 00.0	59.4	353 04.7	44.5	95 52.6	98	28 20.2	+ 21
3	190 18.0	199 51.5	·· 33.9	199 50.2	·· 58.6	204 01.9	·· 59.2	8 07.3	·· 44.5	110 21.4	99	·28 22.3	+ 19
4	205 20.5	214 51.1	32.6	214 50.9	57.8	219 03.8	59.0	23 09.9	44.6	124 50.3	98	28 24.2	+ 17
5	220 23.0	229 50.8	31.3	229 51.5	57.0	234 05.7	58.7	38 12.5	44.7	139 19.1	98	28 25.9	+ 17
6	235 25.4	244 50.4	− 5 30.1	244 52.2	− 4 56.2	249 07.7	− 6 58.5	53 15.0	+ 1 44.7	153 47.9	98	+28 27.6	+ 15
7	250 27.9	259 50.0	28.8	259 52.9	55.5	264 09.6	58.3	68 17.6	44.8	168 16.7	98	28 29.1	+ 13
8	265 30.4	274 49.6	27.5	274 53.6	54.7	279 11.5	58.0	83 20.2	44.8	182 45.5	97	28 30.4	+ 13
9	280 32.8	289 49.2	·· 26.3	289 54.2	·· 53.9	294 13.4	·· 57.8	98 22.8	·· 44.9	197 14.2	97	·28 31.7	+ 10
10	295 35.3	304 48.8	25.0	304 54.9	53.1	309 15.3	57.6	113 25.4	45.0	211 42.9	97	28 32.7	+ 10
11	310 37.8	319 48.5	23.7	319 55.6	52.3	324 17.2	57.4	128 28.0	45.0	226 11.6	96	28 33.7	+ 8
12	325 40.2	334 48.1	− 5 22.5	334 56.3	− 4 51.5	339 19.1	− 6 57.1	143 30.6	+ 1 45.1	240 40.2	97	+28 34.5	+ 7
13	340 42.7	349 47.7	21.2	349 56.9	50.7	354 21.1	56.9	158 33.2	45.2	255 08.9	96	28 35.2	+ 5
14	355 45.2	4 47.3	19.9	4 57.6	49.9	9 23.0	56.7	173 35.8	45.2	269 37.5	96	28 35.7	+ 4
15	10 47.6	19 47.0	·· 18.6	19 58.3	·· 49.1	24 24.9	·· 56.4	188 38.4	·· 45.3	284 06.1	96	·28 36.1	+ 2
16	25 50.1	34 46.6	17.4	34 59.0	48.4	39 26.8	56.2	203 41.0	45.4	298 34.7	96	28 36.3	+ 1
17	40 52.5	49 46.2	16.1	49 59.6	47.6	54 28.7	56.0	218 43.6	45.4	313 03.3	95	28 36.4	0
18	55 55.0	64 45.8	− 5 14.8	65 00.3	− 4 46.8	69 30.6	− 6 55.8	233 46.2	+ 1 45.5	327 31.8	96	+28 36.4	− 2
19	70 57.5	79 45.4	13.6	80 01.0	46.0	84 32.5	55.5	248 48.8	45.6	342 00.4	95	28 36.2	− 3
20	85 59.9	94 45.1	12.3	95 01.7	45.2	99 34.5	55.3	263 51.4	45.6	356 28.9	95	28 35.9	− 5
21	101 02.4	109 44.7	·· 11.0	110 02.3	·· 44.4	114 36.4	·· 55.1	278 53.9	·· 45.7	10 57.4	95	·28 35.4	− 6
22	116 04.9	124 44.3	09.7	125 03.0	43.6	129 38.3	54.8	293 56.5	45.8	25 25.9	96	28 34.8	− 7
23	131 07.3	139 43.9	08.5	140 03.7	42.8	144 40.2	54.6	308 59.1	45.8	39 54.5	95	28 34.1	− 9
0	146 09.8	154 43.6	− 5 07.2	155 04.4	− 4 42.0	159 42.1	− 6 54.4	324 01.7	+ 1 45.9	54 23.0	94	+28 33.2	− 10
1	161 12.3	169 43.2	05.9	170 05.0	41.3	174 44.0	54.1	339 04.3	46.0	68 51.4	95	28 32.2	− 12
2	176 14.7	184 42.8	04.6	185 05.7	40.5	189 45.9	53.9	354 06.9	46.0	83 19.9	95	28 31.0	− 13
3	191 17.2	199 42.4	·· 03.4	200 06.4	·· 39.7	204 47.9	·· 53.7	9 09.5	·· 46.1	97 48.4	95	·28 29.7	− 14
4	206 19.7	214 42.1	02.1	215 07.1	38.9	219 49.8	53.5	24 12.1	46.2	112 16.9	95	28 28.3	− 16
5	221 22.1	229 41.7	5 00.8	230 07.7	38.1	234 51.7	53.2	39 14.7	46.2	126 45.4	95	28 26.7	− 18
6	236 24.6	244 41.3	− 4 59.5	245 08.4	− 4 37.3	249 53.6	− 6 53.0	54 17.3	+ 1 46.3	141 13.9	95	+28 24.9	− 18
7	251 27.0	259 40.9	58.3	260 09.1	36.5	264 55.5	52.8	69 19.9	46.4	155 42.4	94	28 23.1	− 21
8	266 29.5	274 40.6	57.0	275 09.8	35.7	279 57.4	52.5	84 22.5	46.4	170 10.8	95	28 21.0	− 21
9	281 32.0	289 40.2	·· 55.7	290 10.4	·· 34.9	294 59.3	·· 52.3	99 25.1	·· 46.5	184 39.3	95	·28 18.9	− 23
10	296 34.4	304 39.8	54.4	305 11.1	34.2	310 01.3	52.1	114 27.7	46.6	199 07.8	95	28 16.6	− 25
11	311 36.9	319 39.4	53.2	320 11.8	33.4	325 03.2	51.9	129 30.3	46.6	213 36.3	95	28 14.1	− 25
12	326 39.4	334 39.1	− 4 51.9	335 12.5	− 4 32.6	340 05.1	− 6 51.6	144 32.9	+ 1 46.7	228 04.8	96	+28 11.6	− 28
13	341 41.8	349 38.7	50.6	350 13.1	31.8	355 07.0	51.4	159 35.5	46.8	242 33.4	95	28 08.8	− 28
14	356 44.3	4 38.3	49.3	5 13.8	31.0	10 08.9	51.2	174 38.1	46.8	257 01.9	95	28 06.0	− 30
15	11 46.8	19 37.9	·· 48.1	20 14.5	·· 30.2	25 10.8	·· 50.9	189 40.7	·· 46.9	271 30.4	96	·28 03.0	− 32
16	26 49.2	34 37.6	46.8	35 15.2	29.4	40 12.7	50.7	204 43.3	47.0	285 59.0	95	27 59.8	− 33
17	41 51.7	49 37.2	45.5	50 15.8	28.6	55 14.7	50.5	219 45.9	47.0	300 27.5	96	27 56.5	− 34
18	56 54.2	64 36.8	− 4 44.2	65 16.5	− 4 27.8	70 16.6	− 6 50.2	234 48.4	+ 1 47.1	314 56.1	96	+27 53.1	− 35
19	71 56.6	79 36.5	42.9	80 17.2	27.0	85 18.5	50.0	249 51.0	47.2	329 24.7	96	27 49.6	− 38
20	86 59.1	94 36.1	41.7	95 17.9	26.3	100 20.4	49.8	264 53.6	47.2	343 53.3	96	27 45.8	− 38
21	102 01.5	109 35.7	·· 40.4	110 18.6	·· 25.5	115 22.3	·· 49.6	279 56.2	·· 47.3	358 21.9	97	·27 42.0	− 40
22	117 04.0	124 35.3	39.1	125 19.2	24.7	130 24.2	49.3	294 58.8	47.4	12 50.6	96	27 38.0	− 41
23	132 06.5	139 35.0	37.8	140 19.9	23.9	145 26.1	49.1	310 01.4	47.4	27 19.2	97	27 33.9	− 43
24	147 08.9	154 34.6	− 4 36.6	155 20.6	− 4 23.1	160 28.0	− 6 48.9	325 04.0	+ 1 47.5	41 47.9	97	+27 29.6	− 44
code	—	− 4	+ 13	+ 6	+ 8	+ 20	+ 2	+ 26	+ 1				

GCT	SUN GHA	SUN Dec.
h	° ′	° ′
0	176 25.8	−13 01.6
1	191 25.9	13 00.8
2	206 25.9	12 59.9
3	221 25.9	·· 59.1
4	236 25.9	58.2
5	251 26.0	57.4
6	266 26.0	−12 56.5
7	281 26.0	55.7
8	296 26.0	54.8
9	311 26.1	·· 54.0
10	326 26.1	53.1
11	341 26.1	52.3
12	356 26.1	−12 51.4
13	11 26.2	50.6
14	26 26.2	49.7
15	41 26.2	·· 48.9
16	56 26.3	48.0
17	71 26.3	47.1
18	86 26.3	−12 46.3
19	101 26.3	45.4
20	116 26.4	44.6
21	131 26.4	·· 43.7
22	146 26.4	42.9
23	161 26.5	42.0
0	176 26.5	−12 41.1
1	191 26.5	40.3
2	206 26.6	39.4
3	221 26.6	·· 38.6
4	236 26.6	37.7
5	251 26.7	36.8
6	266 26.7	−12 36.0
7	281 26.7	35.1
8	296 26.8	34.3
9	311 26.8	·· 33.4
10	326 26.8	32.5
11	341 26.9	31.7
12	356 26.9	−12 30.8
13	11 26.9	30.0
14	26 27.0	29.1
15	41 27.0	·· 28.2
16	56 27.0	27.4
17	71 27.1	26.5
18	86 27.1	−12 25.6
19	101 27.1	24.8
20	116 27.2	23.9
21	131 27.2	·· 23.0
22	146 27.3	22.2
23	161 27.3	21.3
0	176 27.3	−12 20.4
1	191 27.4	19.6
2	206 27.4	18.7
3	221 27.5	·· 17.8
4	236 27.5	17.0
5	251 27.5	16.1
6	266 27.6	−12 15.2
7	281 27.6	14.4
8	296 27.7	13.5
9	311 27.7	·· 12.6
10	326 27.7	11.8
11	341 27.8	10.9
12	356 27.8	−12 10.0
13	11 27.9	09.1
14	26 27.9	08.3
15	41 28.0	·· 07.4
16	56 28.0	06.5
17	71 28.0	05.7
18	86 28.1	−12 04.8
19	101 28.1	03.9
20	116 28.2	03.0
21	131 28.2	·· 02.2
22	146 28.3	01.3
23	161 28.3	12 00.4
24	176 28.4	−11 59.5
code	—	+ 8

STARS No.	SHA	Dec.	Transit Mer. Gr.
	° ′	° ′	h m
1	358 32.5	+28 49.3	14 23
2	358 22.4	+58 53.0	14 23
3	349 43.1	−18 15.4	14 58
4	339 21.6	+59 59.2	15 39
5	336 01.6	−57 29.3	15 53
6	332 52.9	+89 02.4	16 05
7	328 53.9	+23 14.1	16 21
8	315 53.8	−40 30.1	17 13
9	309 47.7	+49 41.6	17 37
10	291 43.2	+16 24.9	18 49
11	281 57.0	− 8 15.4	19 28
12	281 43.6	+45 57.3	19 29
13	279 22.2	+ 6 18.5	19 39
14	279 11.8	+28 34.3	19 39
15	276 33.8	− 1 13.9	19 50
16	271 51.9	+ 7 24.1	20 09
17	264 16.7	−52 40.2	20 39
18	259 14.8	−16 38.9	20 59
19	255 49.1	−28 54.3	21 13
20	245 48.5	+ 5 21.1	21 52
21	244 24.7	+28 08.9	21 58
22	234 36.8	−59 21.1	22 37
23	223 26.7	−43 14.1	23 22
24	221 49.3	−69 30.9	23 28
25	218 41.9	− 8 26.8	23 41
26	208 33.0	+12 12.3	0 25
27	194 48.1	+62 00.8	1 20
28	183 21.1	+14 50.5	2 06
29	174 01.7	−62 49.6	2 43
30	172 53.1	−56 50.3	2 47
31	168 47.0	−59 25.2	3 04
32	167 01.1	+56 13.2	3 11
33	159 30.0	+55 10.4	3 41
34	159 20.6	−10 54.5	3 41
35	153 35.3	+49 33.0	4 04
36	149 02.9	−36 07.8	4 22
37	146 38.3	+19 25.9	4 32
38	140 56.0	−60 38.1	4 55
39	137 17.0	+74 20.9	5 09
40	126 50.6	+26 52.3	5 51
41	120 38.4	−22 29.2	6 16
42	113 23.9	−26 19.6	6 45
43	109 08.2	−68 56.4	7 02
44	103 06.5	−15 40.2	7 26
45	97 25.8	−37 04.3	7 48
46	96 50.1	+12 35.3	7 51
47	91 08.2	+51 29.2	8 13
48	84 46.2	−34 24.7	8 39
49	81 11.0	+38 43.8	8 53
50	76 56.6	−26 21.7	9 10
51	62 54.3	+ 8 44.0	10 06
52	54 33.4	−56 53.7	10 39
53	50 04.0	+45 06.1	10 57
54	34 33.5	+ 9 38.8	11 59
55	28 42.8	−47 12.1	12 22
56	16 15.9	−29 53.1	13 12
57	14 25.4	+14 56.4	13 19

Lat.	Sunrise	Twlt. begins	Moonrise 15	Moonrise 16	Moonrise 17	Moonrise 18
N °	h m	h m	h m	h m	h m	h m
70	8 32	5 04	□	□	□	□
68	8 17	5 09	□	□	□	□
66	8 04	5 12	□	□	□	□
64	7 54	5 15	□	□	□	□
62	7 45	5 17	7 57	□	□	10 58
60	7 37	5 19	8 48	9 13	10 12	11 40
58	7 31	5 20	9 19	9 53	10 50	12 08
56	7 25	5 21	9 43	10 20	11 17	12 30
54	7 19	5 23	10 02	10 42	11 38	12 48
52	7 15	5 23	10 18	11 00	11 55	13 03
50	7 10	5 23	10 32	11 15	12 10	13 17
45	7 01	5 23	11 01	11 46	12 40	13 44
40	6 53	5 23	11 23	12 09	13 04	14 05
35	6 46	5 22	11 42	12 29	13 23	14 22
30	6 40	5 21	11 58	12 46	13 40	14 38
20	6 29	5 16	12 25	13 15	14 08	15 03
10	6 20	5 09	12 49	13 39	14 32	15 25
0	6 11	5 01	13 11	14 02	14 54	15 46
10	6 02	4 50	13 33	14 25	15 17	16 06
20	5 52	4 34	13 56	14 50	15 41	16 28
30	5 40	4 15	14 24	15 18	16 08	16 54
35	5 34	4 02	14 40	15 35	16 25	17 09
40	5 26	3 45	15 00	15 55	16 44	17 26
45	5 18	3 24	15 23	16 19	17 07	17 46
50	5 07	2 55	15 53	16 51	17 37	18 12
52	5 02	2 39	16 08	17 06	17 52	18 25
54	4 56	2 20	16 25	17 24	18 09	18 39
56	4 50	1 56	16 46	17 47	18 29	18 56
58	4 43	1 19	17 12	18 15	18 54	19 15
60	4 35	////	17 49	18 58	19 29	19 40
S						

Lat.	Sunset	Twlt. ends	Moonset 15	Moonset 16	Moonset 17	Moonset 18
N °	h m	h m	h m	h m	h m	h m
70	15 58	19 30	□	□	□	□
68	16 13	19 25	□	□	□	□
66	16 25	19 20	□	□	□	□
64	16 36	19 18	□	□	□	□
62	16 44	19 14	5 52	□	□	8 15
60	16 52	19 13	5 02	6 23	7 13	7 32
58	16 59	19 12	4 31	5 43	6 34	7 04
56	17 05	19 10	4 07	5 16	6 07	6 41
54	17 10	19 09	3 48	4 54	5 46	6 23
52	17 15	19 09	3 32	4 36	5 28	6 08
50	17 19	19 08	3 19	4 21	5 13	5 54
45	17 28	19 07	2 51	3 51	4 43	5 26
40	17 36	19 07	2 29	3 27	4 19	5 05
35	17 43	19 08	2 10	3 07	4 00	4 46
30	17 49	19 09	1 55	2 50	3 43	4 31
20	18 00	19 14	1 28	2 22	3 14	4 04
10	18 09	19 20	1 06	1 58	2 50	3 41
0	18 18	19 28	0 44	1 35	2 27	3 19
10	18 26	19 38	0 23	1 13	2 04	2 58
20	18 36	19 52	0 01	0 48	1 40	2 34
30	18 47	20 12	24 20	0 20	1 11	2 07
35	18 54	20 25	24 04	0 04	0 54	1 51
40	19 01	20 41	23 44	24 34	0 34	1 32
45	19 10	21 02	23 20	24 10	0 10	1 10
50	19 20	21 29	22 50	23 39	24 40	0 40
52	19 25	21 44	22 35	23 23	24 26	0 26
54	19 31	22 03	22 18	23 05	24 09	0 09
56	19 37	22 26	21 57	22 43	23 49	25 09
58	19 43	22 59	21 30	22 15	23 24	24 50
60	19 51	////	20 52	21 32	22 49	24 25
S						

GCT	Equation of Time (App.—Mean) 15	16	17
h	m s	m s	m s
0	−14 16.7	−14 14.1	−14 10.8
6	−14 16.1	−14 13.3	−14 09.8
12	−14 15.5	−14 12.5	−14 08.8
18	−14 14.8	−14 11.7	−14 07.8
24	−14 14.1	−14 10.8	−14 06.7

GCT of Transit Meridian of Greenwich

DAY	Moon	Venus	Mars	Jupiter	Saturn
	h m	h m	h m	h m	h m
15	19 23	13 40	13 41	13 26	2 32
16	20 15	13 41	13 40	13 23	2 28
17	21 07	13 41	13 39	13 20	2 24
18	21 58	13 42	13 38	13 16	2 19

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb	Venus	Mars
°	′	′	′
0			
30	0.5	0.1	0.1
45	0.5	0.1	0.1
60	0.5	0.1	0.0
75	0.5	0.0	0.0
90	0.5	0.0	0.0

Moon's Lower Limb
Add

Alt.	15	16	17
°	′	′	′
0			
	12.0	12.1	12.4
4			
	12.0	12.1	12.4
8			
	12.0	12.2	12.4
12			
	12.1	12.2	12.4
16			
	12.1	12.2	12.5
20			
	12.2	12.3	12.6
24			
	12.3	12.4	12.6
28			
	12.4	12.5	12.7
32			
	12.5	12.6	12.8
36			
	12.6	12.7	12.9
40			
	12.7	12.8	13.0
44			
	12.8	12.9	13.1
48			
	13.0	13.1	13.3
52			
	13.1	13.2	13.4
56			
	13.3	13.4	13.5
60			
	13.5	13.5	13.7
64			
	13.6	13.7	13.9
68			
	13.8	13.9	14.0
72			
	14.0	14.1	14.2
76			
	14.2	14.3	14.4
80			
	14.4	14.4	14.5
84			
	14.6	14.6	14.7
88			
	14.7	14.8	14.8
90			

Add to table, back cover

Moon's Upper Limb
Subtract

Alt.	15	16	17
°	′	′	′
0			
	17.6	17.5	17.4
4			
	17.6	17.5	17.4
8			
	17.5	17.5	17.3
12			
	17.5	17.4	17.3
16			
	17.5	17.4	17.2
20			
	17.4	17.3	17.2
24			
	17.3	17.2	17.1
28			
	17.2	17.2	17.0
32			
	17.1	17.1	16.9
36			
	17.0	16.9	16.8
40			
	16.9	16.8	16.7
44			
	16.7	16.7	16.6
48			
	16.6	16.6	16.5
52			
	16.4	16.4	16.3
56			
	16.3	16.2	16.2
60			
	16.1	16.1	16.0
64			
	15.9	15.9	15.9
68			
	15.7	15.7	15.7
72			
	15.6	15.6	15.6
76			
	15.4	15.4	15.4
80			
	15.2	15.2	15.2
84			
	15.0	15.0	15.0
88			
	14.8	14.9	14.9
90			

Subtract from table, back cover

G C T	♈	VENUS −3.3		MARS 1.4		JUPITER −1.6		SATURN 0.9		MOON			
	GHA	GHA	Dec.	GHA	Dec.	GHA	Dec.	GHA	Dec.	GHA	code	Dec.	code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
0	147 08.9	154 34.6	− 4 36.6	155 20.6	− 4 23.1	160 28.0	− 6 48.9	325 04.0	+ 1 47.5	41 47.9	97	+27 29.6	− 44
1	162 11.4	169 34.2	35.3	170 21.3	22.3	175 30.0	48.6	340 06.6	47.6	56 16.6	97	27 25.2	− 45
2	177 13.9	184 33.9	34.0	185 21.9	21.5	190 31.9	48.4	355 09.2	47.6	70 45.3	98	27 20.7	− 47
3	192 16.3	199 33.5	·· 32.7	200 22.6	·· 20.7	205 33.8	·· 48.2	10 11.8	·· 47.7	85 14.1	98	·27 16.0	− 48
4	207 18.8	214 33.1	31.4	215 23.3	19.9	220 35.7	47.9	25 14.4	47.8	99 42.9	98	27 11.2	− 50
5	222 21.3	229 32.8	30.2	230 24.0	19.1	235 37.6	47.7	40 17.0	47.8	114 11.7	98	27 06.2	− 51
6	237 23.7	244 32.4	− 4 28.9	245 24.7	− 4 18.4	250 39.5	− 6 47.5	55 19.6	+ 1 47.9	128 40.5	99	+27 01.1	− 52
7	252 26.2	259 32.0	27.6	260 25.3	17.6	265 41.4	47.2	70 22.2	48.0	143 09.4	98	26 55.9	− 54
8	267 28.7	274 31.6	26.3	275 26.0	16.8	280 43.3	47.0	85 24.8	48.0	157 38.2	99	26 50.5	− 55
9	282 31.1	289 31.3	·· 25.0	290 26.7	·· 16.0	295 45.3	·· 46.8	100 27.4	·· 48.1	172 07.1	100	·26 45.0	− 56
10	297 33.6	304 30.9	23.8	305 27.4	15.2	310 47.2	46.6	115 30.0	48.2	186 36.1	100	26 39.4	− 58
11	312 36.0	319 30.5	22.5	320 28.0	14.4	325 49.1	46.3	130 32.6	48.2	201 05.1	100	26 33.6	− 59
12	327 38.5	334 30.2	− 4 21.2	335 28.7	− 4 13.6	340 51.0	− 6 46.1	145 35.2	+ 1 48.3	215 34.1	100	+26 27.7	− 61
13	342 41.0	349 29.8	19.9	350 29.4	12.8	355 52.9	45.9	160 37.8	48.4	230 03.1	101	26 21.6	− 61
14	357 43.4	4 29.4	18.6	5 30.1	12.0	10 54.8	45.6	175 40.4	48.4	244 32.2	101	26 15.5	− 63
15	12 45.9	19 29.1	·· 17.3	20 30.8	·· 11.2	25 56.7	·· 45.4	190 43.0	·· 48.5	259 01.3	101	·26 09.2	− 65
16	27 48.4	34 28.7	16.1	35 31.4	10.5	40 58.7	45.2	205 45.6	48.6	273 30.4	102	26 02.7	− 66
17	42 50.8	49 28.3	14.8	50 32.1	09.7	56 00.6	44.9	220 48.2	48.6	287 59.6	102	25 56.1	− 67
18	57 53.3	64 28.0	− 4 13.5	65 32.8	− 4 08.9	71 02.5	− 6 44.7	235 50.8	+ 1 48.7	302 28.8	103	+25 49.4	− 68
19	72 55.8	79 27.6	12.2	80 33.5	08.1	86 04.4	44.5	250 53.4	48.8	316 58.1	103	25 42.6	− 70
20	87 58.2	94 27.2	10.9	95 34.2	07.3	101 06.3	44.3	265 56.0	48.8	331 27.4	103	25 35.6	− 71
21	103 00.7	109 26.9	·· 09.6	110 34.8	·· 06.5	116 08.2	·· 44.0	280 58.6	·· 48.9	345 56.7	104	·25 28.5	− 72
22	118 03.1	124 26.5	08.4	125 35.5	05.7	131 10.1	43.8	296 01.2	49.0	0 26.1	104	25 21.3	− 74
23	133 05.6	139 26.1	07.1	140 36.2	04.9	146 12.0	43.6	311 03.8	49.0	14 55.5	104	25 13.9	− 75
0	148 08.1	154 25.8	− 4 05.8	155 36.9	− 4 04.1	161 14.0	− 6 43.3	326 06.4	+ 1 49.1	29 24.9	105	+25 06.4	− 76
1	163 10.5	169 25.4	04.5	170 37.6	03.3	176 15.9	43.1	341 09.0	49.2	43 54.4	106	24 58.8	− 77
2	178 13.0	184 25.1	03.2	185 38.2	02.5	191 17.8	42.9	356 11.6	49.2	58 24.0	105	24 51.1	− 79
3	193 15.5	199 24.7	·· 01.9	200 38.9	·· 01.8	206 19.7	·· 42.6	11 14.2	·· 49.3	72 53.5	107	·24 43.2	− 80
4	208 17.9	214 24.3	4 00.7	215 39.6	01.0	221 21.6	42.4	26 16.8	49.4	87 23.2	106	24 35.2	− 81
5	223 20.4	229 24.0	3 59.4	230 40.3	4 00.2	236 23.5	42.2	41 19.4	49.4	101 52.8	107	24 27.1	− 83
6	238 22.9	244 23.6	− 3 58.1	245 41.0	− 3 59.4	251 25.4	− 6 41.9	56 22.0	+ 1 49.5	116 22.5	108	+24 18.8	− 83
7	253 25.3	259 23.2	56.8	260 41.6	58.6	266 27.3	41.7	71 24.6	49.6	130 52.3	108	24 10.5	− 85
8	268 27.8	274 22.9	55.5	275 42.3	57.8	281 29.2	41.5	86 27.2	49.6	145 22.1	108	24 02.0	− 86
9	283 30.3	289 22.5	·· 54.2	290 43.0	·· 57.0	296 31.2	·· 41.2	101 29.8	·· 49.7	159 51.9	109	·23 53.4	− 88
10	298 32.7	304 22.2	53.0	305 43.7	56.2	311 33.1	41.0	116 32.4	49.8	174 21.8	109	23 44.6	− 88
11	313 35.2	319 21.8	51.7	320 44.4	55.4	326 35.0	40.8	131 35.0	49.8	188 51.7	110	23 35.8	− 90
12	328 37.6	334 21.4	− 3 50.4	335 45.1	− 3 54.6	341 36.9	− 6 40.6	146 37.6	+ 1 49.9	203 21.7	110	+23 26.8	− 91
13	343 40.1	349 21.1	49.1	350 45.7	53.8	356 38.8	40.3	161 40.2	50.0	217 51.7	111	23 17.7	− 92
14	358 42.6	4 20.7	47.8	5 46.4	53.0	11 40.7	40.1	176 42.8	50.1	232 21.8	111	23 08.5	− 94
15	13 45.0	19 20.3	·· 46.5	20 47.1	·· 52.3	26 42.6	·· 39.9	191 45.4	·· 50.1	246 51.9	112	·22 59.1	− 94
16	28 47.5	34 20.0	45.2	35 47.8	51.5	41 44.5	39.6	206 48.0	50.2	261 22.1	112	22 49.7	− 96
17	43 50.0	49 19.6	43.9	50 48.5	50.7	56 46.5	39.4	221 50.6	50.3	275 52.3	113	22 40.1	− 97
18	58 52.4	64 19.3	− 3 42.7	65 49.1	− 3 49.9	71 48.4	− 6 39.2	236 53.2	+ 1 50.3	290 22.6	113	+22 30.4	− 98
19	73 54.9	79 18.9	41.4	80 49.8	49.1	86 50.3	38.9	251 55.8	50.4	304 52.9	113	22 20.6	− 99
20	88 57.4	94 18.5	40.1	95 50.5	48.3	101 52.2	38.7	266 58.4	50.5	319 23.2	114	22 10.7	−100
21	103 59.8	109 18.2	·· 38.8	110 51.2	·· 47.5	116 54.1	·· 38.5	282 01.0	·· 50.5	333 53.6	115	·22 00.7	−102
22	119 02.3	124 17.8	37.5	125 51.9	46.7	131 56.0	38.2	297 03.6	50.6	348 24.1	115	21 50.5	−102
23	134 04.8	139 17.5	36.2	140 52.6	45.9	146 57.9	38.0	312 06.2	50.7	2 54.6	115	21 40.3	−104
0	149 07.2	154 17.1	− 3 34.9	155 53.2	− 3 45.1	161 59.8	− 6 37.8	327 08.8	+ 1 50.7	17 25.1	116	+21 29.9	−105
1	164 09.7	169 16.7	33.6	170 53.9	44.3	177 01.8	37.6	342 11.4	50.8	31 55.7	117	21 19.4	−105
2	179 12.1	184 16.4	32.4	185 54.6	43.5	192 03.7	37.3	357 14.0	50.9	46 26.4	117	21 08.9	−107
3	194 14.6	199 16.0	·· 31.1	200 55.3	·· 42.8	207 05.6	·· 37.1	12 16.6	·· 50.9	60 57.1	117	·20 58.2	−108
4	209 17.1	214 15.7	29.8	215 56.0	42.0	222 07.5	36.9	27 19.2	51.0	75 27.8	118	20 47.4	−109
5	224 19.5	229 15.3	28.5	230 56.6	41.2	237 09.4	36.6	42 21.8	51.1	89 58.6	118	20 36.5	−111
6	239 22.0	244 14.9	− 3 27.2	245 57.3	− 3 40.4	252 11.3	− 6 36.4	57 24.5	+ 1 51.2	104 29.4	119	+20 25.4	−111
7	254 24.5	259 14.6	25.9	260 58.0	39.6	267 13.2	36.2	72 27.1	51.2	119 00.3	119	20 14.3	−112
8	269 26.9	274 14.2	24.6	275 58.7	38.8	282 15.1	35.9	87 29.7	51.3	133 31.2	120	20 03.1	−113
9	284 29.4	289 13.9	·· 23.3	290 59.4	·· 38.0	297 17.0	·· 35.7	102 32.3	·· 51.4	148 02.2	121	·19 51.8	−114
10	299 31.9	304 13.5	22.1	306 00.1	37.2	312 19.0	35.5	117 34.9	51.4	162 33.3	120	19 40.4	−116
11	314 34.3	319 13.2	20.8	321 00.7	36.4	327 20.9	35.2	132 37.5	51.5	177 04.3	122	19 28.8	−116
12	329 36.8	334 12.8	− 3 19.5	336 01.4	− 3 35.6	342 22.8	− 6 35.0	147 40.1	+ 1 51.6	191 35.5	121	+19 17.2	−117
13	344 39.2	349 12.4	18.2	351 02.1	34.8	357 24.7	34.8	162 42.7	51.6	206 06.6	122	19 05.5	−119
14	359 41.7	4 12.1	16.9	6 02.8	34.0	12 26.6	34.5	177 45.3	51.7	220 37.8	123	18 53.6	−119
15	14 44.2	19 11.7	·· 15.6	21 03.5	·· 33.2	27 28.5	·· 34.3	192 47.9	·· 51.8	235 09.1	123	·18 41.7	−120
16	29 46.6	34 11.4	14.3	36 04.2	32.5	42 30.4	34.1	207 50.5	51.8	249 40.4	124	18 29.7	−121
17	44 49.1	49 11.0	13.0	51 04.8	31.7	57 32.3	33.8	222 53.1	51.9	264 11.8	124	18 17.6	−122
18	59 51.6	64 10.7	− 3 11.7	66 05.5	− 3 30.9	72 34.2	− 6 33.6	237 55.7	+ 1 52.0	278 43.2	124	+18 05.4	−123
19	74 54.0	79 10.3	10.4	81 06.2	30.1	87 36.2	33.4	252 58.3	52.1	293 14.6	125	17 53.1	−124
20	89 56.5	94 10.0	09.1	96 06.9	29.3	102 38.1	33.2	268 00.9	52.1	307 46.1	125	17 40.7	−125
21	104 59.0	109 09.6	·· 07.9	111 07.6	·· 28.5	117 40.0	·· 32.9	283 03.5	·· 52.2	322 17.6	126	·17 28.2	−126
22	120 01.4	124 09.2	06.6	126 08.3	27.7	132 41.9	32.7	298 06.1	52.3	336 49.2	126	17 15.6	−127
23	135 03.9	139 08.9	05.3	141 09.0	26.9	147 43.8	32.5	313 08.7	52.3	351 20.8	127	17 02.9	−127
24	150 06.4	154 08.5	− 3 04.0	156 09.6	− 3 26.1	162 45.7	− 6 32.2	328 11.3	+ 1 52.4	5 52.5	127	+16 50.2	−129
code	—	− 3	+ 13	+ 6	+ 8	+ 19	+ 3	+ 26	+ 1				

GCT	SUN GHA	SUN Dec.
h	° ′	° ′
0	176 28.4	−11 59.5
1	191 28.4	58.7
2	206 28.4	57.8
3	221 28.5	·· 56.9
4	236 28.5	56.0
5	251 28.6	55.2
6	266 28.6	−11 54.3
7	281 28.7	53.4
8	296 28.7	52.5
9	311 28.8	·· 51.6
10	326 28.8	50.8
11	341 28.9	49.9
12	356 28.9	−11 49.0
13	11 29.0	48.1
14	26 29.0	47.3
15	41 29.1	·· 46.4
16	56 29.1	45.5
17	71 29.2	44.6
18	86 29.2	−11 43.7
19	101 29.3	42.9
20	116 29.3	42.0
21	131 29.4	·· 41.1
22	146 29.5	40.2
23	161 29.5	39.3
0	176 29.6	−11 38.4
1	191 29.6	37.6
2	206 29.7	36.7
3	221 29.7	·· 35.8
4	236 29.8	34.9
5	251 29.8	34.0
6	266 29.9	−11 33.1
7	281 29.9	32.3
8	296 30.0	31.4
9	311 30.1	·· 30.5
10	326 30.1	29.6
11	341 30.2	28.7
12	356 30.2	−11 27.8
13	11 30.3	26.9
14	26 30.3	26.1
15	41 30.4	·· 25.2
16	56 30.5	24.3
17	71 30.5	23.4
18	86 30.6	−11 22.5
19	101 30.6	21.6
20	116 30.7	20.7
21	131 30.7	·· 19.8
22	146 30.8	19.0
23	161 30.9	18.1
0	176 30.9	−11 17.2
1	191 31.0	16.3
2	206 31.1	15.4
3	221 31.1	·· 14.5
4	236 31.2	13.6
5	251 31.2	12.7
6	266 31.3	−11 11.8
7	281 31.4	10.9
8	296 31.4	10.0
9	311 31.5	·· 09.2
10	326 31.6	08.3
11	341 31.6	07.4
12	356 31.7	−11 06.5
13	11 31.7	05.6
14	26 31.8	04.7
15	41 31.9	·· 03.8
16	56 31.9	02.9
17	71 32.0	02.0
18	86 32.1	−11 01.1
19	101 32.1	11 00.2
20	116 32.2	10 59.3
21	131 32.3	·· 58.4
22	146 32.3	57.5
23	161 32.4	56.6
24	176 32.5	−10 55.7
code	—	+ 9

STARS No.	SHA	Dec.	Transit Mer. Gr.
	° ′	° ′	h m
1	358 32.5	+28 49.3	14 11
2	358 22.4	+58 52.9	14 12
3	349 43.1	−18 15.4	14 46
4	339 21.6	+59 59.2	15 27
5	336 01.6	−57 29.3	15 41
6	332 53.7	+89 02.4	15 53
7	328 54.0	+23 14.0	16 09
8	315 53.8	−40 30.1	17 01
9	309 47.8	+49 41.6	17 25
10	291 43.2	+16 24.9	18 38
11	281 57.0	− 8 15.4	19 16
12	281 43.7	+45 57.3	19 17
13	279 22.2	+ 6 18.5	19 27
14	279 11.8	+28 34.3	19 27
15	276 33.8	− 1 13.9	19 38
16	271 51.9	+ 7 24.1	19 57
17	264 16.7	−52 40.2	20 27
18	259 14.8	−16 38.9	20 47
19	255 49.1	−28 54.3	21 01
20	245 48.5	+ 5 21.1	21 41
21	244 24.7	+28 08.9	21 46
22	234 36.9	−59 21.2	22 25
23	223 26.7	−43 14.1	23 10
24	221 49.3	−69 31.0	23 16
25	218 41.9	− 8 26.8	23 29
26	208 33.0	+12 12.3	0 13
27	194 48.1	+62 00.8	1 08
28	183 21.1	+14 50.5	1 54
29	174 01.6	−62 49.6	2 31
30	172 53.1	−56 50.3	2 35
31	168 47.0	−59 25.2	2 52
32	167 01.0	+56 13.2	2 59
33	159 30.0	+55 10.4	3 29
34	159 20.5	−10 54.6	3 30
35	153 35.3	+49 33.0	3 52
36	149 02.9	−36 07.9	4 11
37	146 38.3	+19 25.8	4 20
38	140 56.0	−60 38.1	4 43
39	137 16.9	+74 20.9	4 58
40	126 50.6	+26 52.3	5 39
41	120 38.4	−22 29.2	6 04
42	113 23.9	−26 19.6	6 33
43	109 08.1	−68 56.4	6 50
44	103 06.5	−15 40.2	7 14
45	97 25.8	−37 04.3	7 36
46	96 50.1	+12 35.3	7 39
47	91 08.2	+51 29.2	8 02
48	84 46.2	−34 24.7	8 27
49	81 11.0	+38 43.8	8 41
50	76 56.6	−26 21.7	8 58
51	62 54.2	+ 8 44.0	9 54
52	54 33.4	−56 53.7	10 28
53	50 04.0	+45 06.0	10 45
54	34 33.5	+ 9 38.8	11 47
55	28 42.8	−47 12.1	12 11
56	16 15.9	−29 53.1	13 00
57	14 25.4	+14 56.4	13 08

Lat.	Sunrise	Twlt. begins	Moonrise 18	19	20	21
N °	h m	h m	h m	h m	h m	h m
70	8 18	4 53	□	□	12 26	15 24
68	8 04	4 59	□	□	13 25	15 44
66	7 53	5 03	□	11 17	13 58	16 00
64	7 44	5 06	□	12 20	14 22	16 13
62	7 36	5 09	10 58	12 54	14 41	16 24
60	7 29	5 12	11 40	13 18	14 57	16 33
58	7 23	5 14	12 08	13 38	15 10	16 41
56	7 18	5 15	12 30	13 54	15 21	16 48
54	7 13	5 16	12 48	14 08	15 31	16 55
52	7 09	5 18	13 03	14 20	15 40	17 00
50	7 05	5 19	13 17	14 30	15 48	17 05
45	6 56	5 20	13 44	14 53	16 04	17 16
40	6 49	5 19	14 05	15 10	16 18	17 25
35	6 43	5 19	14 22	15 25	16 29	17 33
30	6 37	5 18	14 38	15 38	16 39	17 40
20	6 27	5 14	15 03	16 00	16 56	17 51
10	6 19	5 08	15 25	16 19	17 11	18 01
0	6 11	5 01	15 46	16 36	17 25	18 11
10	6 02	4 50	16 06	16 54	17 38	18 20
20	5 53	4 37	16 28	17 12	17 53	18 30
30	5 43	4 18	16 54	17 34	18 09	18 42
35	5 37	4 06	17 09	17 46	18 19	18 48
40	5 30	3 50	17 26	18 01	18 30	18 56
45	5 22	3 31	17 46	18 18	18 43	19 04
50	5 12	3 04	18 12	18 38	18 58	19 14
52	5 08	2 49	18 25	18 48	19 06	19 19
54	5 03	2 33	18 39	18 59	19 14	19 24
56	4 57	2 11	18 56	19 12	19 23	19 30
58	4 51	1 43	19 15	19 26	19 33	19 36
60	4 44	0 49	19 40	19 43	19 44	19 44
S						

Lat.	Sunset	Twlt. ends	Moonset 18	19	20	21
N °	h m	h m	h m	h m	h m	h m
70	16 12	19 42	□	□	10 18	8 59
68	16 25	19 35	□	□	9 18	8 36
66	16 36	19 30	□	9 44	8 43	8 19
64	16 45	19 26	□	8 39	8 18	8 04
62	16 53	19 23	8 15	8 05	7 58	7 52
60	17 00	19 20	7 32	7 39	7 42	7 42
58	17 06	19 18	7 04	7 19	7 28	7 33
56	17 11	19 16	6 41	7 02	7 16	7 25
54	17 16	19 15	6 23	6 48	7 05	7 17
52	17 20	19 13	6 08	6 35	6 56	7 11
50	17 24	19 12	5 54	6 24	6 47	7 05
45	17 33	19 11	5 26	6 01	6 29	6 52
40	17 40	19 11	5 05	5 43	6 15	6 42
35	17 46	19 11	4 46	5 27	6 02	6 33
30	17 51	19 11	4 31	5 13	5 51	6 25
20	18 01	19 15	4 04	4 50	5 32	6 11
10	18 09	19 20	3 41	4 29	5 15	5 58
0	18 17	19 27	3 19	4 10	5 00	5 47
10	18 25	19 37	2 58	3 51	4 44	5 35
20	18 34	19 50	2 34	3 30	4 27	5 23
30	18 44	20 08	2 07	3 07	4 07	5 08
35	18 50	20 20	1 51	2 52	3 56	5 00
40	18 57	20 35	1 32	2 36	3 42	4 50
45	19 05	20 55	1 10	2 16	3 27	4 39
50	19 15	21 21	0 40	1 51	3 07	4 25
52	19 19	21 34	0 26	1 39	2 58	4 18
54	19 24	21 51	0 09	1 25	2 47	4 11
56	19 29	22 11	25 09	1 09	2 35	4 03
58	19 35	22 38	24 50	0 50	2 21	3 53
60	19 42	23 22	24 25	0 25	2 05	3 43
S						

GCT	Equation of Time (App.—Mean) 18	19	20
h	m s	m s	m s
0	−14 06.7	−14 01.9	−13 56.4
6	−14 05.5	−14 00.6	−13 54.9
12	−14 04.4	−13 59.2	−13 53.4
18	−14 03.1	−13 57.8	−13 51.9
24	−14 01.9	−13 56.4	−13 50.3

GCT of Transit Meridian of Greenwich

DAY	Moon	Venus	Mars	Jupiter	Saturn
	h m	h m	h m	h m	h m
18	21 58	13 42	13 38	13 16	2 19
19	22 48	13 43	13 37	13 13	2 15
20	23 36	13 43	13 36	13 10	2 11
21	24 22	13 44	13 35	13 07	2 07

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb	Venus	Mars
°	′	′	′
0			
30	0.5	0.1	0.1
45	0.5	0.1	0.1
60	0.5	0.1	0.0
75	0.5	0.0	0.0
90	0.5	0.0	0.0

Moon's Lower Limb
Add

Alt.	18	19	20
°	′	′	′
0			
	12.9	13.5	14.2
4			
	12.9	13.5	14.2
8			
	12.9	13.5	14.2
12			
	12.9	13.6	14.2
16			
	13.0	13.6	14.2
20			
	13.0	13.6	14.2
24			
	13.1	13.7	14.3
28			
	13.2	13.7	14.3
32			
	13.2	13.8	14.3
36			
	13.3	13.9	14.4
40			
	13.4	13.9	14.4
44			
	13.5	14.0	14.5
48			
	13.6	14.1	14.5
52			
	13.7	14.2	14.6
56			
	13.9	14.3	14.7
60			
	14.0	14.4	14.7
64			
	14.1	14.5	14.8
68			
	14.3	14.6	14.9
72			
	14.4	14.7	14.9
76			
	14.5	14.8	15.0
80			
	14.7	14.9	15.1
84			
	14.8	15.0	15.2
88			
	14.9	15.1	15.2
90			

Add to table, back cover

Moon's Upper Limb
Subtract

Alt.	18	19	20
°	′	′	′
0			
	17.1	16.7	16.4
4			
	17.1	16.7	16.3
8			
	17.0	16.7	16.3
12			
	17.0	16.7	16.3
16			
	17.0	16.6	16.3
20			
	16.9	16.6	16.3
24			
	16.9	16.6	16.2
28			
	16.8	16.5	16.2
32			
	16.7	16.4	16.2
36			
	16.6	16.4	16.1
40			
	16.5	16.3	16.1
44			
	16.4	16.2	16.0
48			
	16.3	16.1	16.0
52			
	16.2	16.1	15.9
56			
	16.1	16.0	15.8
60			
	16.0	15.9	15.8
64			
	15.8	15.8	15.7
68			
	15.7	15.7	15.6
72			
	15.6	15.6	15.6
76			
	15.4	15.4	15.5
80			
	15.3	15.3	15.4
84			
	15.1	15.2	15.3
88			
	15.0	15.1	15.3
90			

Subtract from table, back cover

G C T	♈	VENUS −3.3		MARS 1.4		JUPITER −1.6		SATURN 0.8		MOON			
	GHA	GHA	Dec.	GHA	Dec.	GHA	Dec.	GHA	Dec.	GHA	code	Dec.	code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
0	150 06.4	154 08.5	− 3 04.0	156 09.6	− 3 26.1	162 45.7	− 6 32.2	328 11.3	+ 1 52.4	5 52.5	127	+16 50.2	−129
1	165 08.8	169 08.2	02.7	171 10.3	25.3	177 47.6	32.0	343 13.9	52.5	20 24.2	128	16 37.3	−129
2	180 11.3	184 07.8	01.4	186 11.0	24.5	192 49.5	31.8	358 16.5	52.5	34 56.0	128	16 24.4	−130
3	195 13.7	199 07.5	3 00.1	201 11.7	23.7	207 51.4	31.5	13 19.1	52.6	49 27.8	128	16 11.4	−131
4	210 16.2	214 07.1	2 58.8	216 12.4	22.9	222 53.3	31.3	28 21.7	52.7	63 59.6	129	15 58.3	−132
5	225 18.7	229 06.8	57.5	231 13.1	22.2	237 55.3	31.1	43 24.4	52.8	78 31.5	129	15 45.1	−133
6	240 21.1	244 06.4	− 2 56.2	246 13.8	− 3 21.4	252 57.2	− 6 30.8	58 27.0	+ 1 52.8	93 03.4	129	+15 31.8	−133
7	255 23.6	259 06.1	54.9	261 14.4	20.6	267 59.1	30.6	73 29.6	52.9	107 35.3	130	15 18.5	−135
8	270 26.1	274 05.7	53.6	276 15.1	19.8	283 01.0	30.4	88 32.2	53.0	122 07.3	130	15 05.0	−135
9	285 28.5	289 05.4	52.3	291 15.8	19.0	298 02.9	30.1	103 34.8	53.0	136 39.3	131	14 51.5	−136
10	300 31.0	304 05.0	51.1	306 16.5	18.2	313 04.8	29.9	118 37.4	53.1	151 11.4	131	14 37.9	−136
11	315 33.5	319 04.6	49.8	321 17.2	17.4	328 06.7	29.7	133 40.0	53.2	165 43.5	132	14 24.3	−138
12	330 35.9	334 04.3	− 2 48.5	336 17.9	− 3 16.6	343 08.6	− 6 29.4	148 42.6	+ 1 53.2	180 15.7	131	+14 10.5	−138
13	345 38.4	349 03.9	47.2	351 18.5	15.8	358 10.5	29.2	163 45.2	53.3	194 47.8	132	13 56.7	−139
14	0 40.9	4 03.6	45.9	6 19.2	15.0	13 12.5	29.0	178 47.8	53.4	209 20.0	133	13 42.8	−139
15	15 43.3	19 03.2	44.6	21 19.9	14.2	28 14.4	28.7	193 50.4	53.5	223 52.3	133	13 28.9	−141
16	30 45.8	34 02.9	43.3	36 20.6	13.4	43 16.3	28.5	208 53.0	53.5	238 24.6	133	13 14.8	−141
17	45 48.2	49 02.5	42.0	51 21.3	12.6	58 18.2	28.3	223 55.6	53.6	252 56.9	133	13 00.7	−142
18	60 50.7	64 02.2	− 2 40.7	66 22.0	− 3 11.8	73 20.1	− 6 28.0	238 58.2	+ 1 53.7	267 29.2	134	+12 46.5	−142
19	75 53.2	79 01.8	39.4	81 22.7	11.1	88 22.0	27.8	254 00.8	53.7	282 01.6	134	12 32.3	−143
20	90 55.6	94 01.5	38.1	96 23.4	10.3	103 23.9	27.6	269 03.5	53.8	296 34.0	134	12 18.0	−144
21	105 58.1	109 01.1	36.8	111 24.0	09.5	118 25.8	27.3	284 06.1	53.9	311 06.4	135	12 03.6	−145
22	121 00.6	124 00.8	35.5	126 24.7	08.7	133 27.7	27.1	299 08.7	53.9	325 38.9	135	11 49.1	−145
23	136 03.0	139 00.4	34.2	141 25.4	07.9	148 29.6	26.9	314 11.3	54.0	340 11.4	135	11 34.6	−145
0	151 05.5	154 00.1	− 2 32.9	156 26.1	− 3 07.1	163 31.6	− 6 26.7	329 13.9	+ 1 54.1	354 43.9	135	+11 20.1	−147
1	166 08.0	168 59.7	31.6	171 26.8	06.3	178 33.5	26.4	344 16.5	54.2	9 16.4	136	11 05.4	−147
2	181 10.4	183 59.4	30.3	186 27.5	05.5	193 35.4	26.2	359 19.1	54.2	23 49.0	136	10 50.7	−147
3	196 12.9	198 59.0	29.1	201 28.2	04.7	208 37.3	26.0	14 21.7	54.3	38 21.6	136	10 36.0	−149
4	211 15.3	213 58.7	27.8	216 28.9	03.9	223 39.2	25.7	29 24.3	54.4	52 54.2	137	10 21.1	−148
5	226 17.8	228 58.3	26.5	231 29.5	03.1	238 41.1	25.5	44 26.9	54.4	67 26.9	136	10 06.3	−150
6	241 20.3	243 58.0	− 2 25.2	246 30.2	− 3 02.3	253 43.0	− 6 25.3	59 29.5	+ 1 54.5	81 59.5	137	+ 9 51.3	−150
7	256 22.7	258 57.6	23.9	261 30.9	01.5	268 44.9	25.0	74 32.1	54.6	96 32.2	137	9 36.3	−150
8	271 25.2	273 57.3	22.6	276 31.6	00.7	283 46.8	24.8	89 34.8	54.7	111 04.9	138	9 21.3	−151
9	286 27.7	288 56.9	21.3	291 32.3	3 00.0	298 48.7	24.6	104 37.4	54.7	125 37.7	137	9 06.2	−151
10	301 30.1	303 56.6	20.0	306 33.0	2 59.2	313 50.7	24.3	119 40.0	54.8	140 10.4	138	8 51.1	−152
11	316 32.6	318 56.2	18.7	321 33.7	58.4	328 52.6	24.1	134 42.6	54.9	154 43.2	137	8 35.9	−153
12	331 35.1	333 55.9	− 2 17.4	336 34.4	− 2 57.6	343 54.5	− 6 23.9	149 45.2	+ 1 54.9	169 15.9	138	+ 8 20.6	−153
13	346 37.5	348 55.5	16.1	351 35.0	56.8	358 56.4	23.6	164 47.8	55.0	183 48.7	139	8 05.3	−153
14	1 40.0	3 55.2	14.8	6 35.7	56.0	13 58.3	23.4	179 50.4	55.1	198 21.6	138	7 50.0	−154
15	16 42.5	18 54.8	13.5	21 36.4	55.2	29 00.2	23.2	194 53.0	55.2	212 54.4	138	7 34.6	−155
16	31 44.9	33 54.5	12.2	36 37.1	54.4	44 02.1	22.9	209 55.6	55.2	227 27.2	139	7 19.1	−154
17	46 47.4	48 54.2	10.9	51 37.8	53.6	59 04.0	22.7	224 58.2	55.3	242 00.1	138	7 03.7	−156
18	61 49.8	63 53.8	− 2 09.6	66 38.5	− 2 52.8	74 05.9	− 6 22.5	240 00.8	+ 1 55.4	256 32.9	139	+ 6 48.1	−155
19	76 52.3	78 53.5	08.3	81 39.2	52.0	89 07.8	22.2	255 03.5	55.4	271 05.8	139	6 32.6	−156
20	91 54.8	93 53.1	07.0	96 39.9	51.2	104 09.7	22.0	270 06.1	55.5	285 38.7	139	6 17.0	−157
21	106 57.2	108 52.8	05.7	111 40.5	50.4	119 11.7	21.8	285 08.7	55.6	300 11.6	139	6 01.3	−157
22	121 59.7	123 52.4	04.4	126 41.2	49.6	134 13.6	21.5	300 11.3	55.7	314 44.5	139	5 45.6	−157
23	137 02.2	138 52.1	03.1	141 41.9	48.8	149 15.5	21.3	315 13.9	55.7	329 17.4	139	5 29.9	−157
0	152 04.6	153 51.7	− 2 01.8	156 42.6	− 2 48.1	164 17.4	− 6 21.1	330 16.5	+ 1 55.8	343 50.3	139	+ 5 14.2	−158
1	167 07.1	168 51.4	2 00.5	171 43.3	47.3	179 19.3	20.8	345 19.1	55.9	358 23.2	139	4 58.4	−158
2	182 09.6	183 51.0	1 59.2	186 44.0	46.5	194 21.2	20.6	0 21.7	55.9	12 56.1	139	4 42.6	−159
3	197 12.0	198 50.7	57.9	201 44.7	45.7	209 23.1	20.4	15 24.3	56.0	27 29.0	139	4 26.7	−159
4	212 14.5	213 50.3	56.6	216 45.4	44.9	224 25.0	20.1	30 26.9	56.1	42 01.9	139	4 10.8	−159
5	227 17.0	228 50.0	55.3	231 46.1	44.1	239 26.9	19.9	45 29.6	56.2	56 34.8	139	3 54.9	−159
6	242 19.4	243 49.6	− 1 54.0	246 46.8	− 2 43.3	254 28.8	− 6 19.7	60 32.2	+ 1 56.2	71 07.7	139	+ 3 39.0	−160
7	257 21.9	258 49.3	52.7	261 47.4	42.5	269 30.8	19.4	75 34.8	56.3	85 40.6	139	3 23.0	−160
8	272 24.3	273 49.0	51.4	276 48.1	41.7	284 32.7	19.2	90 37.4	56.4	100 13.5	139	3 07.0	−160
9	287 26.8	288 48.6	50.1	291 48.8	40.9	299 34.6	19.0	105 40.0	56.4	114 46.4	139	2 51.0	−161
10	302 29.3	303 48.3	48.8	306 49.5	40.1	314 36.5	18.7	120 42.6	56.5	129 19.3	139	2 34.9	−161
11	317 31.7	318 47.9	47.5	321 50.2	39.3	329 38.4	18.5	135 45.2	56.6	143 52.2	139	2 18.8	−160
12	332 34.2	333 47.6	− 1 46.2	336 50.9	− 2 38.5	344 40.3	− 6 18.3	150 47.8	+ 1 56.7	158 25.1	139	+ 2 02.8	−162
13	347 36.7	348 47.2	44.9	351 51.6	37.7	359 42.2	18.0	165 50.4	56.7	172 58.0	138	1 46.6	−161
14	2 39.1	3 46.9	43.6	6 52.3	36.9	14 44.1	17.8	180 53.1	56.8	187 30.8	139	1 30.5	−161
15	17 41.6	18 46.5	42.3	21 53.0	36.1	29 46.0	17.6	195 55.7	56.9	202 03.7	138	1 14.4	−162
16	32 44.1	33 46.2	41.1	36 53.7	35.4	44 47.9	17.3	210 58.3	56.9	216 36.5	138	0 58.2	−162
17	47 46.5	48 45.9	39.8	51 54.3	34.6	59 49.8	17.1	226 00.9	57.0	231 09.3	138	0 42.0	−162
18	62 49.0	63 45.5	− 1 38.5	66 55.0	− 2 33.8	74 51.7	− 6 16.9	241 03.5	+ 1 57.1	245 42.1	138	+ 0 25.8	−162
19	77 51.4	78 45.2	37.2	81 55.7	33.0	89 53.7	16.6	256 06.1	57.2	260 14.9	138	+ 0 09.6	−162
20	92 53.9	93 44.8	35.9	96 56.4	32.2	104 55.6	16.4	271 08.7	57.2	274 47.7	137	− 0 06.6	−162
21	107 56.4	108 44.5	34.6	111 57.1	31.4	119 57.5	16.2	286 11.3	57.3	289 20.4	137	0 22.8	−162
22	122 58.8	123 44.1	33.3	126 57.8	30.6	134 59.4	15.9	301 14.0	57.4	303 53.1	138	0 39.0	−163
23	138 01.3	138 43.8	32.0	141 58.5	29.8	150 01.3	15.7	316 16.6	57.5	318 25.9	136	0 55.3	−162
24	153 03.8	153 43.5	− 1 30.7	156 59.2	− 2 29.0	165 03.2	− 6 15.5	331 19.2	+ 1 57.5	332 58.5	137	− 1 11.5	−163
code	−	− 4	+ 13	+ 6	+ 8	+ 19	+ 3	+ 26	+ 1				

GCT h	SUN GHA ° ′	SUN Dec. ° ′
0	176 32.5	−10 55.7
1	191 32.5	54.8
2	206 32.6	53.9
3	221 32.7 ••	53.0
4	236 32.7	52.1
5	251 32.8	51.2
6	266 32.9	−10 50.3
7	281 33.0	49.4
8	296 33.0	48.5
9	311 33.1 ••	47.6
10	326 33.2	46.7
11	341 33.2	45.8
12	356 33.3	−10 44.9
13	11 33.4	44.0
14	26 33.5	43.1
15	41 33.5 ••	42.2
16	56 33.6	41.3
17	71 33.7	40.4
18	86 33.7	−10 39.5
19	101 33.8	38.6
20	116 33.9	37.7
21	131 34.0 ••	36.8
22	146 34.0	35.9
23	161 34.1	35.0
0	176 34.2	−10 34.1
1	191 34.3	33.2
2	206 34.3	32.3
3	221 34.4 ••	31.4
4	236 34.5	30.5
5	251 34.6	29.6
6	266 34.6	−10 28.7
7	281 34.7	27.8
8	296 34.8	26.9
9	311 34.9 ••	26.0
10	326 34.9	25.1
11	341 35.0	24.1
12	356 35.1	−10 23.2
13	11 35.2	22.3
14	26 35.3	21.4
15	41 35.3 ••	20.5
16	56 35.4	19.6
17	71 35.5	18.7
18	86 35.6	−10 17.8
19	101 35.6	16.9
20	116 35.7	16.0
21	131 35.8 ••	15.1
22	146 35.9	14.2
23	161 36.0	13.2
0	176 36.0	−10 12.3
1	191 36.1	11.4
2	206 36.2	10.5
3	221 36.3 ••	09.6
4	236 36.4	08.7
5	251 36.5	07.8
6	266 36.5	−10 06.9
7	281 36.6	06.0
8	296 36.7	05.0
9	311 36.8 ••	04.1
10	326 36.9	03.2
11	341 37.0	02.3
12	356 37.0	−10 01.4
13	11 37.1	10 00.5
14	26 37.2	9 59.6
15	41 37.3 ••	58.6
16	56 37.4	57.7
17	71 37.5	56.8
18	86 37.6	− 9 55.9
19	101 37.6	55.0
20	116 37.7	54.1
21	131 37.8 ••	53.1
22	146 37.9	52.2
23	161 38.0	51.3
24	176 38.1	− 9 50.4
code	−	+ 9

STARS No.	SHA ° ′	Dec. ° ′	Transit Mer. Gr. h m
1	358 32.5	+28 49.2	13 59
2	358 22.4	+58 52.9	14 00
3	349 43.1	−18 15.4	14 34
4	339 21.6	+59 59.2	15 16
5	336 01.6	−57 29.3	15 29
6	332 54.5	+89 02.4	15 41
7	328 54.0	+23 14.0	15 57
8	315 53.9	−40 30.1	16 49
9	309 47.8	+49 41.6	17 14
10	291 43.2	+16 24.9	18 26
11	281 57.0	− 8 15.4	19 05
12	281 43.7	+45 57.3	19 06
13	279 22.2	+ 6 18.5	19 15
14	279 11.8	+28 34.3	19 16
15	276 33.8	− 1 13.9	19 26
16	271 51.9	+ 7 24.1	19 45
17	264 16.7	−52 40.2	20 15
18	259 14.8	−16 38.9	20 35
19	255 49.2	−28 54.3	20 49
20	245 48.5	+ 5 21.1	21 29
21	244 24.7	+28 08.9	21 34
22	234 36.9	−59 21.2	22 14
23	223 26.7	−43 14.1	22 58
24	221 49.3	−69 31.0	23 05
25	218 41.9	− 8 26.8	23 17
26	208 33.0	+12 12.3	0 01
27	194 48.1	+62 00.8	0 56
28	183 21.1	+14 50.5	1 42
29	174 01.6	−62 49.7	2 19
30	172 53.1	−56 50.3	2 24
31	168 46.9	−59 25.3	2 40
32	167 01.0	+56 13.2	2 47
33	159 30.0	+55 10.5	3 17
34	159 20.5	−10 54.6	3 18
35	153 35.3	+49 33.0	3 41
36	149 02.8	−36 07.9	3 59
37	146 38.3	+19 25.8	4 08
38	140 55.9	−60 38.1	4 31
39	137 16.9	+74 20.9	4 46
40	126 50.6	+26 52.3	5 27
41	120 38.4	−22 29.2	5 52
42	113 23.9	−26 19.6	6 21
43	109 08.1	−68 56.4	6 38
44	103 06.4	−15 40.2	7 02
45	97 25.8	−37 04.3	7 25
46	96 50.1	+12 35.3	7 27
47	91 08.2	+51 29.2	7 50
48	84 46.2	−34 24.7	8 15
49	81 11.0	+38 43.8	8 30
50	76 56.6	−26 21.7	8 46
51	62 54.2	+ 8 44.0	9 42
52	54 33.4	−56 53.7	10 16
53	50 04.0	+45 06.0	10 34
54	34 33.5	+ 9 38.8	11 35
55	28 42.8	−47 12.0	11 59
56	16 15.9	−29 53.1	12 48
57	14 25.4	+14 56.4	12 56

Lat. °	Sunrise h m	Twlt. begins h m	Moonrise 21 h m	Moonrise 22 h m	Moonrise 23 h m	Moonrise 24 h m
N 70	8 04	4 39	15 24	17 37	19 42	21 50
68	7 52	4 47	15 44	17 46	19 42	21 41
66	7 42	4 53	16 00	17 52	19 42	21 33
64	7 34	4 57	16 13	17 58	19 42	21 27
62	7 27	5 01	16 24	18 03	19 42	21 22
60	7 21	5 04	16 33	18 08	19 42	21 17
58	7 15	5 06	16 41	18 12	19 42	21 13
56	7 11	5 08	16 48	18 15	19 41	21 10
54	7 06	5 11	16 55	18 18	19 41	21 06
52	7 02	5 12	17 00	18 21	19 41	21 03
50	6 59	5 13	17 05	18 23	19 41	21 01
45	6 51	5 15	17 16	18 29	19 41	20 55
40	6 45	5 16	17 25	18 33	19 41	20 50
35	6 39	5 15	17 33	18 37	19 41	20 46
30	6 34	5 15	17 40	18 40	19 41	20 43
20	6 25	5 12	17 51	18 46	19 41	20 37
10	6 18	5 07	18 01	18 51	19 41	20 31
0	6 10	5 00	18 11	18 56	19 41	20 26
10	6 03	4 52	18 20	19 01	19 41	20 22
20	5 55	4 38	18 30	19 06	19 41	20 16
30	5 45	4 20	18 42	19 12	19 41	20 11
35	5 40	4 09	18 48	19 15	19 41	20 07
40	5 34	3 54	18 56	19 19	19 41	20 04
45	5 26	3 36	19 04	19 23	19 41	19 59
50	5 17	3 11	19 14	19 28	19 41	19 54
52	5 13	2 58	19 19	19 30	19 41	19 52
54	5 09	2 43	19 24	19 33	19 41	19 49
56	5 04	2 25	19 30	19 36	19 41	19 47
58	4 58	2 00	19 36	19 39	19 41	19 43
60	4 52	1 23	19 44	19 43	19 41	19 40
S						

Lat. °	Sunset h m	Twlt. ends h m	Moonset 21 h m	Moonset 22 h m	Moonset 23 h m	Moonset 24 h m
N 70	16 25	19 53	8 59	8 21	7 52	7 25
68	16 37	19 46	8 36	8 10	7 49	7 28
66	16 47	19 40	8 19	8 01	7 46	7 31
64	16 55	19 35	8 04	7 54	7 44	7 34
62	17 02	19 31	7 52	7 47	7 42	7 36
60	17 08	19 28	7 42	7 41	7 40	7 38
58	17 13	19 24	7 33	7 36	7 38	7 40
56	17 18	19 22	7 25	7 31	7 37	7 42
54	17 22	19 20	7 17	7 27	7 35	7 43
52	17 26	19 19	7 11	7 23	7 34	7 45
50	17 29	19 17	7 05	7 20	7 33	7 46
45	17 37	19 15	6 52	7 12	7 31	7 48
40	17 43	19 13	6 42	7 06	7 28	7 51
35	17 49	19 14	6 33	7 00	7 27	7 53
30	17 54	19 14	6 25	6 56	7 25	7 54
20	18 02	19 16	6 11	6 47	7 22	7 57
10	18 10	19 21	5 58	6 40	7 20	8 00
0	18 17	19 27	5 47	6 33	7 17	8 02
10	18 24	19 35	5 35	6 25	7 15	8 05
20	18 32	19 48	5 23	6 18	7 12	8 07
30	18 42	20 05	5 08	6 09	7 09	8 10
35	18 47	20 16	5 00	6 04	7 08	8 12
40	18 53	20 30	4 50	5 58	7 06	8 14
45	19 00	20 48	4 39	5 51	7 03	8 16
50	19 09	21 13	4 25	5 43	7 00	8 19
52	19 13	21 25	4 18	5 39	6 59	8 20
54	19 17	21 39	4 11	5 34	6 58	8 22
56	19 22	21 58	4 03	5 30	6 56	8 23
58	19 28	22 21	3 53	5 24	6 54	8 25
60	19 34	22 55	3 43	5 18	6 52	8 27
S						

GCT h	Equation of Time (App.—Mean) 21 m s	22 m s	23 m s
0	−13 50.3	−13 43.4	−13 36.0
6	−13 48.6	−13 41.6	−13 34.0
12	−13 46.9	−13 39.8	−13 32.0
18	−13 45.2	−13 37.9	−13 30.0
24	−13 43.4	−13 36.0	−13 27.9

GCT of Transit Meridian of Greenwich

DAY	Moon h m	Venus h m	Mars h m	Jupiter h m	Saturn h m
21	24 22	13 44	13 35	13 07	2 07
22	0 22	13 44	13 34	13 04	2 03
23	1 07	13 45	13 33	13 01	1 59
24	1 52	13 45	13 31	12 58	1 54

ADDITIONAL ALTITUDE CORRECTIONS

Alt. °	Sun's Low'r Limb ′	Venus ′	Mars ′
0			
	0.5	0.1	0.1
30			
	0.5	0.1	0.1
45			
	0.5	0.1	0.0
60			
	0.5	0.0	0.0
75			
	0.5	0.0	0.0
90			

Moon's Lower Limb *Add*

Alt. °	21 ′	22 ′	23 ′
0			
	14.9	15.7	16.3
4			
	14.9	15.7	16.3
8			
	14.9	15.7	16.3
12			
	14.9	15.7	16.3
16			
	14.9	15.7	16.3
20			
	15.0	15.7	16.3
24			
	15.0	15.7	16.3
28			
	15.0	15.7	16.2
32			
	15.0	15.7	16.2
36			
	15.0	15.7	16.2
40			
	15.0	15.7	16.2
44			
	15.1	15.6	16.1
48			
	15.1	15.6	16.1
52			
	15.1	15.6	16.1
56			
	15.1	15.6	16.0
60			
	15.2	15.6	16.0
64			
	15.2	15.6	16.0
68			
	15.2	15.6	15.9
72			
	15.3	15.6	15.9
76			
	15.3	15.6	15.8
80			
	15.3	15.6	15.8
84			
	15.4	15.6	15.8
88			
	15.4	15.6	15.7
90			

Add to table, back cover

Moon's Upper Limb *Subtract*

Alt. °	21 ′	22 ′	23 ′
0			
	15.9	15.5	15.1
4			
	15.9	15.5	15.1
8			
	15.9	15.5	15.1
12			
	15.9	15.5	15.1
16			
	15.9	15.5	15.1
20			
	15.9	15.5	15.2
24			
	15.9	15.5	15.2
28			
	15.8	15.5	15.2
32			
	15.8	15.5	15.2
36			
	15.8	15.5	15.2
40			
	15.8	15.5	15.3
44			
	15.8	15.5	15.3
48			
	15.7	15.5	15.3
52			
	15.7	15.5	15.4
56			
	15.7	15.5	15.4
60			
	15.6	15.5	15.4
64			
	15.6	15.5	15.5
68			
	15.6	15.5	15.5
72			
	15.6	15.6	15.5
76			
	15.5	15.6	15.6
80			
	15.5	15.6	15.6
84			
	15.4	15.6	15.7
88			
	15.4	15.6	15.7
90			

Subtract from table, back cover

Full Moon 21
Washington's Birthday 22

1951 FEBRUARY 24, 25, 26, (SAT., SUN., MON.)

GCT	♈ GHA	VENUS −3.3 GHA	VENUS Dec.	MARS 1.4 GHA	MARS Dec.	JUPITER −1.6 GHA	JUPITER Dec.	SATURN 0.8 GHA	SATURN Dec.	MOON GHA	code	MOON Dec.	code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
0	153 03.8	153 43.5	− 1 30.7	156 59.2	− 2 29.0	165 03.2	− 6 15.5	331 19.2	+ 1 57.5	332 58.5	137	− 1 11.5	−163
1	168 06.2	168 43.1	29.4	171 59.9	28.2	180 05.1	15.2	346 21.8	57.6	347 31.2	136	1 27.8	−162
2	183 08.7	183 42.8	28.1	187 00.6	27.4	195 07.0	15.0	1 24.4	57.7	2 03.8	136	1 44.0	−163
3	198 11.2	198 42.4	·· 26.8	202 01.3	·· 26.6	210 08.9	·· 14.8	16 27.0	·· 57.7	16 36.4	136	· 2 00.3	−162
4	213 13.6	213 42.1	25.5	217 01.9	25.8	225 10.8	14.5	31 29.6	57.8	31 09.0	136	2 16.5	−163
5	228 16.1	228 41.7	24.2	232 02.6	25.0	240 12.7	14.3	46 32.3	57.9	45 41.6	135	2 32.8	−162
6	243 18.6	243 41.4	− 1 22.9	247 03.3	− 2 24.2	255 14.7	− 6 14.1	61 34.9	+ 1 58.0	60 14.1	135	− 2 49.0	−163
7	258 21.0	258 41.1	21.6	262 04.0	23.4	270 16.6	13.8	76 37.5	58.0	74 46.6	135	3 05.3	−162
8	273 23.5	273 40.7	20.3	277 04.7	22.7	285 18.5	13.6	91 40.1	58.1	89 19.1	134	3 21.5	−162
9	288 25.9	288 40.4	·· 19.0	292 05.4	·· 21.9	300 20.4	·· 13.4	106 42.7	·· 58.2	103 51.5	134	· 3 37.7	−163
10	303 28.4	303 40.0	17.7	307 06.1	21.1	315 22.3	13.1	121 45.3	58.2	118 23.9	133	3 54.0	−162
11	318 30.9	318 39.7	16.4	322 06.8	20.3	330 24.2	12.9	136 47.9	58.3	132 56.2	134	4 10.2	−162
12	333 33.3	333 39.4	− 1 15.1	337 07.5	− 2 19.5	345 26.1	− 6 12.7	151 50.5	+ 1 58.4	147 28.6	132	− 4 26.4	−162
13	348 35.8	348 39.0	13.8	352 08.2	18.7	0 28.0	12.4	166 53.2	58.5	162 00.8	133	4 42.6	−162
14	3 38.3	3 38.7	12.4	7 08.9	17.9	15 29.9	12.2	181 55.8	58.5	176 33.1	132	4 58.8	−162
15	18 40.7	18 38.3	·· 11.1	22 09.6	·· 17.1	30 31.8	·· 12.0	196 58.4	·· 58.6	191 05.3	131	· 5 15.0	−161
16	33 43.2	33 38.0	09.8	37 10.2	16.3	45 33.7	11.7	212 01.0	58.7	205 37.4	132	5 31.1	−162
17	48 45.7	48 37.6	08.5	52 10.9	15.5	60 35.6	11.5	227 03.6	58.8	220 09.6	130	5 47.3	−161
18	63 48.1	63 37.3	− 1 07.2	67 11.6	− 2 14.7	75 37.6	− 6 11.3	242 06.2	+ 1 58.8	234 41.6	131	− 6 03.4	−161
19	78 50.6	78 37.0	05.9	82 12.3	13.9	90 39.5	11.0	257 08.8	58.9	249 13.7	129	6 19.5	−161
20	93 53.0	93 36.6	04.6	97 13.0	13.1	105 41.4	10.8	272 11.5	59.0	263 45.6	130	6 35.6	−160
21	108 55.5	108 36.3	·· 03.3	112 13.7	·· 12.3	120 43.3	·· 10.6	287 14.1	·· 59.1	278 17.6	129	· 6 51.6	−160
22	123 58.0	123 35.9	02.0	127 14.4	11.5	135 45.2	10.3	302 16.7	59.1	292 49.5	128	7 07.6	−160
23	139 00.4	138 35.6	1 00.7	142 15.1	10.7	150 47.1	10.1	317 19.3	59.2	307 21.3	128	7 23.6	−160
0	154 02.9	153 35.3	− 0 59.4	157 15.8	− 2 10.0	165 49.0	− 6 09.9	332 21.9	+ 1 59.3	321 53.1	127	− 7 39.6	−160
1	169 05.4	168 34.9	58.1	172 16.5	09.2	180 50.9	09.6	347 24.5	59.3	336 24.8	127	7 55.6	−159
2	184 07.8	183 34.6	56.8	187 17.2	08.4	195 52.8	09.4	2 27.2	59.4	350 56.5	126	8 11.5	−159
3	199 10.3	198 34.2	·· 55.5	202 17.9	·· 07.6	210 54.7	·· 09.2	17 29.8	·· 59.5	5 28.1	126	· 8 27.4	−158
4	214 12.8	213 33.9	54.2	217 18.6	06.8	225 56.6	08.9	32 32.4	59.6	19 59.7	125	8 43.2	−159
5	229 15.2	228 33.6	52.9	232 19.3	06.0	240 58.5	08.7	47 35.0	59.6	34 31.2	124	8 59.1	−157
6	244 17.7	243 33.2	− 0 51.6	247 19.9	− 2 05.2	256 00.5	− 6 08.5	62 37.6	+ 1 59.7	49 02.6	124	− 9 14.8	−158
7	259 20.2	258 32.9	50.3	262 20.6	04.4	271 02.4	08.2	77 40.2	59.8	63 34.0	123	9 30.6	−157
8	274 22.6	273 32.6	49.0	277 21.3	03.6	286 04.3	08.0	92 42.8	59.9	78 05.3	123	9 46.3	−157
9	289 25.1	288 32.2	·· 47.7	292 22.0	·· 02.8	301 06.2	·· 07.8	107 45.5	· 1 59.9	92 36.6	122	·10 02.0	−156
10	304 27.5	303 31.9	46.4	307 22.7	02.0	316 08.1	07.5	122 48.1	2 00.0	107 07.8	121	10 17.6	−156
11	319 30.0	318 31.5	45.1	322 23.4	01.2	331 10.0	07.3	137 50.7	00.1	121 38.9	121	10 33.2	−155
12	334 32.5	333 31.2	− 0 43.8	337 24.1	− 2 00.4	346 11.9	− 6 07.1	152 53.3	+ 2 00.2	136 10.0	120	−10 48.7	−155
13	349 34.9	348 30.9	42.5	352 24.8	1 59.6	1 13.8	06.8	167 55.9	00.2	150 41.0	119	11 04.2	−155
14	4 37.4	3 30.5	41.2	7 25.5	58.8	16 15.7	06.6	182 58.5	00.3	165 11.9	118	11 19.7	−154
15	19 39.9	18 30.2	·· 39.9	22 26.2	·· 58.0	31 17.6	·· 06.4	198 01.2	·· 00.4	179 42.7	118	·11 35.1	−153
16	34 42.3	33 29.8	38.6	37 26.9	57.2	46 19.5	06.1	213 03.8	00.4	194 13.5	117	11 50.4	−153
17	49 44.8	48 29.5	37.3	52 27.6	56.5	61 21.4	05.9	228 06.4	00.5	208 44.2	117	12 05.7	−152
18	64 47.3	63 29.2	− 0 36.0	67 28.3	− 1 55.7	76 23.3	− 6 05.7	243 09.0	+ 2 00.6	223 14.9	116	−12 20.9	−152
19	79 49.7	78 28.8	34.7	82 29.0	54.9	91 25.3	05.4	258 11.6	00.7	237 45.5	114	12 36.1	−151
20	94 52.2	93 28.5	33.4	97 29.7	54.1	106 27.2	05.2	273 14.2	00.7	252 15.9	115	12 51.2	−151
21	109 54.7	108 28.2	·· 32.1	112 30.4	·· 53.3	121 29.1	·· 05.0	288 16.9	·· 00.8	266 46.4	113	·13 06.3	−150
22	124 57.1	123 27.8	30.8	127 31.1	52.5	136 31.0	04.7	303 19.5	00.9	281 16.7	113	13 21.3	−150
23	139 59.6	138 27.5	29.5	142 31.7	51.7	151 32.9	04.5	318 22.1	01.0	295 47.0	111	13 36.3	−148
0	155 02.0	153 27.1	− 0 28.2	157 32.4	− 1 50.9	166 34.8	− 6 04.3	333 24.7	+ 2 01.0	310 17.1	111	−13 51.1	−149
1	170 04.5	168 26.8	26.9	172 33.1	50.1	181 36.7	04.0	348 27.3	01.1	324 47.2	111	14 06.0	−147
2	185 07.0	183 26.5	25.6	187 33.8	49.3	196 38.6	03.8	3 29.9	01.2	339 17.3	109	14 20.7	−147
3	200 09.4	198 26.1	·· 24.3	202 34.5	·· 48.5	211 40.5	·· 03.6	18 32.6	·· 01.3	353 47.2	108	·14 35.4	−146
4	215 11.9	213 25.8	23.0	217 35.2	47.7	226 42.4	03.3	33 35.2	01.3	8 17.0	108	14 50.0	−145
5	230 14.4	228 25.5	21.7	232 35.9	46.9	241 44.3	03.1	48 37.8	01.4	22 46.8	107	15 04.5	−145
6	245 16.8	243 25.1	− 0 20.4	247 36.6	− 1 46.1	256 46.2	− 6 02.9	63 40.4	+ 2 01.5	37 16.5	106	−15 19.0	−144
7	260 19.3	258 24.8	19.1	262 37.3	45.3	271 48.1	02.6	78 43.0	01.6	51 46.1	105	15 33.4	−143
8	275 21.8	273 24.5	17.8	277 38.0	44.5	286 50.0	02.4	93 45.7	01.6	66 15.6	104	15 47.7	−142
9	290 24.2	288 24.1	·· 16.5	292 38.7	·· 43.7	301 52.0	·· 02.2	108 48.3	·· 01.7	80 45.0	103	·16 01.9	−142
10	305 26.7	303 23.8	15.2	307 39.4	43.0	316 53.9	01.9	123 50.9	01.8	95 14.3	103	16 16.1	−141
11	320 29.1	318 23.4	13.8	322 40.1	42.2	331 55.8	01.7	138 53.5	01.9	109 43.6	101	16 30.2	−140
12	335 31.6	333 23.1	− 0 12.5	337 40.8	− 1 41.4	346 57.7	− 6 01.4	153 56.1	+ 2 01.9	124 12.7	101	−16 44.2	−139
13	350 34.1	348 22.8	11.2	352 41.5	40.6	1 59.6	01.2	168 58.7	02.0	138 41.8	99	16 58.1	−138
14	5 36.5	3 22.4	09.9	7 42.2	39.8	17 01.5	01.0	184 01.4	02.1	153 10.7	99	17 11.9	−137
15	20 39.0	18 22.1	·· 08.6	22 42.9	·· 39.0	32 03.4	·· 00.7	199 04.0	·· 02.2	167 39.6	97	·17 25.6	−137
16	35 41.5	33 21.8	07.3	37 43.6	38.2	47 05.3	00.5	214 06.6	02.2	182 08.3	97	17 39.3	−135
17	50 43.9	48 21.4	06.0	52 44.3	37.4	62 07.2	00.3	229 09.2	02.3	196 37.0	96	17 52.8	−135
18	65 46.4	63 21.1	− 0 04.7	67 45.0	− 1 36.6	77 09.1	− 6 00.0	244 11.8	+ 2 02.4	211 05.6	95	−18 06.3	−134
19	80 48.9	78 20.8	03.4	82 45.7	35.8	92 11.0	5 59.8	259 14.5	02.5	225 34.1	94	18 19.7	−132
20	95 51.3	93 20.4	02.1	97 46.4	35.0	107 12.9	59.6	274 17.1	02.5	240 02.5	93	18 32.9	−132
21	110 53.8	108 20.1	− 0 00.8	112 47.0	·· 34.2	122 14.8	·· 59.3	289 19.7	·· 02.6	254 30.8	91	·18 46.1	−131
22	125 56.3	123 19.7	+ 0 00.5	127 47.7	33.4	137 16.7	59.1	304 22.3	02.7	268 58.9	91	18 59.2	−129
23	140 58.7	138 19.4	01.8	142 48.4	32.6	152 18.7	58.9	319 24.9	02.8	283 27.0	90	19 12.1	−129
24	156 01.2	153 19.1	+ 0 03.1	157 49.1	− 1 31.8	167 20.6	− 5 58.6	334 27.6	+ 2 02.8	297 55.0	89	−19 25.0	−128
code	—	− 3	+ 13	+ 7	+ 8	+ 19	+ 3	+ 26	0				

GCT h	SUN GHA ° ′	SUN Dec. ° ′
0	176 38.1	− 9 50.4
1	191 38.2	49.5
2	206 38.3	48.6
3	221 38.3	·· 47.6
4	236 38.4	46.7
5	251 38.5	45.8
6	266 38.6	− 9 44.9
7	281 38.7	44.0
8	296 38.8	43.0
9	311 38.9	·· 42.1
10	326 39.0	41.2
11	341 39.1	40.3
12	356 39.1	− 9 39.4
13	11 39.2	38.5
14	26 39.3	37.5
15	41 39.4	·· 36.6
16	56 39.5	35.7
17	71 39.6	34.8
18	86 39.7	− 9 33.8
19	101 39.8	32.9
20	116 39.9	32.0
21	131 40.0	·· 31.1
22	146 40.1	30.2
23	161 40.2	29.2
0	176 40.3	− 9 28.3
1	191 40.3	27.4
2	206 40.4	26.5
3	221 40.5	·· 25.5
4	236 40.6	24.6
5	251 40.7	23.7
6	266 40.8	− 9 22.8
7	281 40.9	21.8
8	296 41.0	20.9
9	311 41.1	·· 20.0
10	326 41.2	19.1
11	341 41.3	18.1
12	356 41.4	− 9 17.2
13	11 41.5	16.3
14	26 41.6	15.4
15	41 41.7	·· 14.4
16	56 41.8	13.5
17	71 41.9	12.6
18	86 42.0	− 9 11.7
19	101 42.1	10.7
20	116 42.2	09.8
21	131 42.3	·· 08.9
22	146 42.4	07.9
23	161 42.5	07.0
0	176 42.6	− 9 06.1
1	191 42.7	05.2
2	206 42.8	04.2
3	221 42.9	·· 03.3
4	236 43.0	02.4
5	251 43.1	01.4
6	266 43.2	− 9 00.5
7	281 43.3	8 59.6
8	296 43.4	58.6
9	311 43.5	·· 57.7
10	326 43.6	56.8
11	341 43.7	55.8
12	356 43.8	− 8 54.9
13	11 43.9	54.0
14	26 44.0	53.0
15	41 44.1	·· 52.1
16	56 44.2	51.2
17	71 44.3	50.3
18	86 44.4	− 8 49.3
19	101 44.5	48.4
20	116 44.6	47.5
21	131 44.7	·· 46.5
22	146 44.8	45.6
23	161 44.9	44.6
24	176 45.0	− 8 43.7
code	−	+ 9

STARS No.	SHA ° ′	Dec. ° ′	Transit Mer. Gr. h m
1	358 32.5	+28 49.2	13 47
2	358 22.4	+58 52.9	13 48
3	349 43.1	−18 15.4	14 23
4	339 21.6	+59 59.1	15 04
5	336 01.6	−57 29.2	15 17
6	332 55.3	+89 02.4	15 30
7	328 54.0	+23 14.0	15 46
8	315 53.9	−40 30.1	16 37
9	309 47.8	+49 41.6	17 02
10	291 43.2	+16 24.9	18 14
11	281 57.0	− 8 15.4	18 53
12	281 43.7	+45 57.3	18 54
13	279 22.2	+ 6 18.5	19 03
14	279 11.8	+28 34.3	19 04
15	276 33.8	− 1 13.9	19 14
16	271 51.9	+ 7 24.1	19 33
17	264 16.7	−52 40.2	20 03
18	259 14.8	−16 38.9	20 23
19	255 49.2	−28 54.3	20 37
20	245 48.5	+ 5 21.1	21 17
21	244 24.7	+28 08.9	21 23
22	234 36.9	−59 21.2	22 02
23	223 26.7	−43 14.1	22 46
24	221 49.3	−69 31.0	22 53
25	218 41.9	− 8 26.8	23 05
26	208 33.0	+12 12.3	23 46
27	194 48.0	+62 00.8	0 44
28	183 21.1	+14 50.5	1 30
29	174 01.6	−62 49.7	2 07
30	172 53.0	−56 50.4	2 12
31	168 46.9	−59 25.3	2 28
32	167 01.0	+56 13.2	2 35
33	159 29.9	+55 10.5	3 05
34	159 20.5	−10 54.6	3 06
35	153 35.2	+49 33.0	3 29
36	149 02.8	−36 07.9	3 47
37	146 38.2	+19 25.8	3 57
38	140 55.9	−60 38.1	4 19
39	137 16.8	+74 20.9	4 34
40	126 50.6	+26 52.3	5 16
41	120 38.3	−22 29.2	5 40
42	113 23.9	−26 19.6	6 09
43	109 08.0	−68 56.4	6 26
44	103 06.4	−15 40.2	6 50
45	97 25.7	−37 04.3	7 13
46	96 50.1	+12 35.3	7 15
47	91 08.1	+51 29.2	7 38
48	84 46.2	−34 24.7	8 03
49	81 11.0	+38 43.8	8 18
50	76 56.6	−26 21.7	8 35
51	62 54.2	+ 8 44.0	9 31
52	54 33.3	−56 53.7	10 04
53	50 04.0	+45 06.0	10 22
54	34 33.5	+ 9 38.8	11 24
55	28 42.8	−47 12.0	11 47
56	16 15.9	−29 53.0	12 37
57	14 25.4	+14 56.4	12 44

Lat. °	Sunrise h m	Twlt. begins h m	Moonrise 24 h m	25 h m	26 h m	27 h m
N 70	7 49	4 26	21 50	24 13	0 13	■
68	7 39	4 35	21 41	23 50	26 33	2 33
66	7 31	4 42	21 33	23 33	25 51	1 51
64	7 24	4 47	21 27	23 19	25 22	1 22
62	7 18	4 52	21 22	23 07	25 01	1 01
60	7 12	4 56	21 17	22 57	24 43	0 43
58	7 08	4 59	21 13	22 49	24 29	0 29
56	7 03	5 02	21 10	22 41	24 17	0 17
54	7 00	5 04	21 06	22 34	24 06	0 06
52	6 56	5 05	21 03	22 28	23 56	25 27
50	6 53	5 07	21 01	22 23	23 48	25 15
45	6 46	5 10	20 55	22 11	23 30	24 51
40	6 41	5 12	20 50	22 02	23 16	24 32
35	6 36	5 13	20 46	21 54	23 04	24 16
30	6 31	5 12	20 43	21 47	22 53	24 02
20	6 23	5 10	20 37	21 34	22 35	23 39
10	6 16	5 07	20 31	21 24	22 19	23 19
0	6 10	5 00	20 26	21 14	22 05	23 00
10	6 03	4 52	20 22	21 04	21 50	22 41
20	5 56	4 40	20 16	20 54	21 35	22 22
30	5 48	4 24	20 11	20 42	21 18	21 59
35	5 43	4 13	20 07	20 36	21 08	21 46
40	5 37	3 59	20 04	20 28	20 56	21 31
45	5 30	3 42	19 59	20 19	20 43	21 13
50	5 23	3 19	19 54	20 09	20 27	20 51
52	5 19	3 07	19 52	20 04	20 20	20 41
54	5 15	2 53	19 49	19 59	20 11	20 29
56	5 10	2 36	19 47	19 53	20 02	20 16
58	5 05	2 15	19 43	19 46	19 51	20 00
60 S	5 00	1 47	19 40	19 39	19 39	19 42

Lat. °	Sunset h m	Twlt. ends h m	Moonset 24 h m	25 h m	26 h m	27 h m
N 70	16 39	20 07	7 25	6 54	6 13	■
68	16 49	19 57	7 28	7 06	6 37	5 42
66	16 57	19 50	7 31	7 16	6 56	6 26
64	17 04	19 44	7 34	7 24	7 12	6 56
62	17 10	19 39	7 36	7 31	7 25	7 18
60	17 15	19 34	7 38	7 37	7 36	7 37
58	17 20	19 31	7 40	7 42	7 46	7 52
56	17 24	19 28	7 42	7 47	7 55	8 05
54	17 28	19 26	7 43	7 52	8 02	8 17
52	17 31	19 23	7 45	7 56	8 09	8 27
50	17 34	19 22	7 46	7 59	8 15	8 36
45	17 41	19 19	7 48	8 07	8 29	8 55
40	17 47	19 17	7 51	8 14	8 40	9 11
35	17 51	19 15	7 53	8 20	8 50	9 24
30	17 56	19 16	7 54	8 25	8 58	9 36
20	18 03	19 17	7 57	8 34	9 13	9 56
10	18 10	19 20	8 00	8 41	9 26	10 14
0	18 17	19 27	8 02	8 49	9 38	10 31
10	18 23	19 34	8 05	8 56	9 50	10 47
20	18 30	19 45	8 07	9 04	10 03	11 05
30	18 38	20 01	8 10	9 13	10 18	11 26
35	18 43	20 12	8 12	9 18	10 27	11 38
40	18 49	20 25	8 14	9 24	10 37	11 52
45	18 55	20 41	8 16	9 31	10 49	12 09
50	19 03	21 04	8 19	9 39	11 03	12 29
52	19 06	21 15	8 20	9 43	11 10	12 39
54	19 10	21 28	8 22	9 48	11 17	12 50
56	19 14	21 44	8 23	9 52	11 26	13 03
58	19 19	22 04	8 25	9 58	11 35	13 18
60 S	19 25	22 31	8 27	10 04	11 46	13 35

Equation of Time (App.—Mean)

GCT h	24 m s	25 m s	26 m s
0	−13 27.9	−13 19.2	−13 09.9
6	−13 25.8	−13 16.9	−13 07.5
12	−13 23.6	−13 14.6	−13 05.1
18	−13 21.4	−13 12.3	−13 02.6
24	−13 19.2	−13 09.9	−13 00.1

GCT of Transit Meridian of Greenwich

DAY	Moon h m	Venus h m	Mars h m	Jupiter h m	Saturn h m
24	1 52	13 45	13 31	12 58	1 54
25	2 37	13 46	13 30	12 55	1 50
26	3 26	13 47	13 29	12 52	1 46
27	4 18	13 47	13 28	12 49	1 42

ADDITIONAL ALTITUDE CORRECTIONS

Alt. °	Sun's Low'r Limb ′	Venus ′	Mars ′
0			
	0.5	0.1	0.1
30			
	0.5	0.1	0.1
45			
	0.5	0.1	0.0
60			
	0.5	0.0	0.0
75			
	0.5	0.0	0.0
90			

Moon's Lower Limb
Add

Alt. °	24 ′	25 ′	26 ′
0			
	16.8	17.3	17.8
4			
	16.8	17.3	17.8
8			
	16.8	17.3	17.8
12			
	16.8	17.3	17.8
16			
	16.8	17.3	17.8
20			
	16.8	17.2	17.7
24			
	16.7	17.2	17.7
28			
	16.7	17.1	17.6
32			
	16.7	17.1	17.5
36			
	16.6	17.0	17.5
40			
	16.6	17.0	17.4
44			
	16.5	16.9	17.3
48			
	16.5	16.8	17.2
52			
	16.4	16.8	17.1
56			
	16.4	16.7	17.0
60			
	16.3	16.6	16.9
64			
	16.2	16.5	16.8
68			
	16.2	16.4	16.7
72			
	16.1	16.3	16.5
76			
	16.0	16.2	16.4
80			
	16.0	16.1	16.3
84			
	15.9	16.0	16.2
88			
	15.8	16.0	16.1
90			

Add to table, back cover

Moon's Upper Limb
Subtract

Alt. °	24 ′	25 ′	26 ′
0			
	14.8	14.5	14.2
4			
	14.8	14.5	14.3
8			
	14.8	14.6	14.3
12			
	14.9	14.6	14.3
16			
	14.9	14.6	14.3
20			
	14.9	14.6	14.4
24			
	14.9	14.7	14.4
28			
	15.0	14.7	14.5
32			
	15.0	14.8	14.5
36			
	15.0	14.8	14.6
40			
	15.1	14.9	14.7
44			
	15.1	15.0	14.8
48			
	15.2	15.0	14.9
52			
	15.2	15.1	15.0
56			
	15.3	15.2	15.1
60			
	15.4	15.3	15.2
64			
	15.4	15.4	15.3
68			
	15.5	15.5	15.4
72			
	15.5	15.5	15.5
76			
	15.6	15.6	15.7
80			
	15.7	15.7	15.8
84			
	15.8	15.8	15.9
88			
	15.8	15.9	16.0
90			

Subtract from table, back cover

GCT	♈ GHA	VENUS −3.4 GHA	VENUS Dec.	MARS 1.4 GHA	MARS Dec.	JUPITER −1.6 GHA	JUPITER Dec.	SATURN 0.8 GHA	SATURN Dec.	MOON GHA	code	MOON Dec.	code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
0	156 01.2	153 19.1	+ 0 03.1	157 49.1	− 1 31.8	167 20.6	− 5 58.6	334 27.6	+ 2 02.8	297 55.0	89	−19 25.0	−128
1	171 03.6	168 18.7	04.4	172 49.8	31.0	182 22.5	58.4	349 30.2	02.9	312 22.9	88	19 37.8	−126
2	186 06.1	183 18.4	05.7	187 50.5	30.3	197 24.4	58.2	4 32.8	03.0	326 50.7	87	19 50.4	−126
3	201 08.6	198 18.1	07.0	202 51.2	29.5	212 26.3	57.9	19 35.4	03.0	341 18.4	86	20 03.0	−124
4	216 11.0	213 17.7	08.3	217 51.9	28.7	227 28.2	57.7	34 38.0	03.1	355 46.0	84	20 15.4	−123
5	231 13.5	228 17.4	09.6	232 52.6	27.9	242 30.1	57.5	49 40.7	03.2	10 13.4	84	20 27.7	−122
6	246 16.0	243 17.1	+ 0 10.9	247 53.3	− 1 27.1	257 32.0	− 5 57.2	64 43.3	+ 2 03.3	24 40.8	83	−20 39.9	−121
7	261 18.4	258 16.7	12.2	262 54.0	26.3	272 33.9	57.0	79 45.9	03.3	39 08.1	82	20 52.0	−120
8	276 20.9	273 16.4	13.5	277 54.7	25.5	287 35.8	56.8	94 48.5	03.4	53 35.3	80	21 04.0	−118
9	291 23.4	288 16.1	14.8	292 55.4	24.7	302 37.7	56.5	109 51.1	03.5	68 02.3	80	21 15.8	−118
10	306 25.8	303 15.7	16.1	307 56.1	23.9	317 39.6	56.3	124 53.8	03.6	82 29.3	79	21 27.6	−116
11	321 28.3	318 15.4	17.4	322 56.8	23.1	332 41.5	56.1	139 56.4	03.6	96 56.2	77	21 39.2	−115
12	336 30.8	333 15.1	+ 0 18.7	337 57.5	− 1 22.3	347 43.4	− 5 55.8	154 59.0	+ 2 03.7	111 22.9	77	−21 50.7	−114
13	351 33.2	348 14.7	20.0	352 58.2	21.5	2 45.4	55.6	170 01.6	03.8	125 49.6	75	22 02.1	−112
14	6 35.7	3 14.4	21.3	7 58.9	20.7	17 47.3	55.4	185 04.2	03.9	140 16.1	75	22 13.3	−111
15	21 38.1	18 14.1	22.6	22 59.6	19.9	32 49.2	55.1	200 06.9	03.9	154 42.6	73	22 24.4	−110
16	36 40.6	33 13.7	24.0	38 00.3	19.1	47 51.1	54.9	215 09.5	04.0	169 08.9	72	22 35.4	−108
17	51 43.1	48 13.4	25.3	53 01.0	18.3	62 53.0	54.6	230 12.1	04.1	183 35.1	72	22 46.2	−107
18	66 45.5	63 13.1	+ 0 26.6	68 01.7	− 1 17.6	77 54.9	− 5 54.4	245 14.7	+ 2 04.2	198 01.3	70	−22 56.9	−106
19	81 48.0	78 12.7	27.9	83 02.4	16.8	92 56.8	54.2	260 17.4	04.2	212 27.3	69	23 07.5	−105
20	96 50.5	93 12.4	29.2	98 03.1	16.0	107 58.7	53.9	275 20.0	04.3	226 53.2	68	23 18.0	−103
21	111 52.9	108 12.1	30.5	113 03.8	15.2	123 00.6	53.7	290 22.6	04.4	241 19.0	68	23 28.3	−101
22	126 55.4	123 11.7	31.8	128 04.5	14.4	138 02.5	53.5	305 25.2	04.5	255 44.8	66	23 38.4	−100
23	141 57.9	138 11.4	33.1	143 05.2	13.6	153 04.4	53.2	320 27.8	04.6	270 10.4	65	23 48.4	− 99
0	157 00.3	153 11.1	+ 0 34.4	158 05.9	− 1 12.8	168 06.3	− 5 53.0	335 30.5	+ 2 04.6	284 35.9	64	−23 58.3	− 97
1	172 02.8	168 10.7	35.7	173 06.6	12.0	183 08.2	52.8	350 33.1	04.7	299 01.3	63	24 08.0	− 96
2	187 05.2	183 10.4	37.0	188 07.3	11.2	198 10.1	52.5	5 35.7	04.8	313 26.6	62	24 17.6	− 94
3	202 07.7	198 10.1	38.3	203 08.0	10.4	213 12.0	52.3	20 38.3	04.9	327 51.8	61	24 27.0	− 93
4	217 10.2	213 09.7	39.6	218 08.7	09.6	228 14.0	52.1	35 40.9	04.9	342 16.9	60	24 36.3	− 92
5	232 12.6	228 09.4	40.9	233 09.4	08.8	243 15.9	51.8	50 43.6	05.0	356 41.9	60	24 45.5	− 89
6	247 15.1	243 09.1	+ 0 42.2	248 10.1	− 1 08.0	258 17.8	− 5 51.6	65 46.2	+ 2 05.1	11 06.9	58	−24 54.4	− 88
7	262 17.6	258 08.7	43.5	263 10.8	07.2	273 19.7	51.4	80 48.8	05.2	25 31.7	57	25 03.2	− 87
8	277 20.0	273 08.4	44.8	278 11.5	06.4	288 21.6	51.1	95 51.4	05.2	39 56.4	56	25 11.9	− 85
9	292 22.5	288 08.1	46.1	293 12.2	05.6	303 23.5	50.9	110 54.1	05.3	54 21.0	55	25 20.4	− 84
10	307 25.0	303 07.7	47.4	308 12.9	04.9	318 25.4	50.7	125 56.7	05.4	68 45.5	55	25 28.8	− 81
11	322 27.4	318 07.4	48.7	323 13.6	04.1	333 27.3	50.4	140 59.3	05.5	83 10.0	53	25 36.9	− 81
12	337 29.9	333 07.1	+ 0 50.0	338 14.3	− 1 03.3	348 29.2	− 5 50.2	156 01.9	+ 2 05.5	97 34.3	53	−25 45.0	− 78
13	352 32.4	348 06.7	51.3	353 15.0	02.5	3 31.1	49.9	171 04.5	05.6	111 58.6	51	25 52.8	− 77
14	7 34.8	3 06.4	52.6	8 15.7	01.7	18 33.0	49.7	186 07.2	05.7	126 22.7	51	26 00.5	− 75
15	22 37.3	18 06.1	53.9	23 16.4	00.9	33 34.9	49.5	201 09.8	05.8	140 46.8	50	26 08.0	− 74
16	37 39.7	33 05.7	55.2	38 17.1	1 00.1	48 36.8	49.2	216 12.4	05.8	155 10.8	49	26 15.4	− 72
17	52 42.2	48 05.4	56.5	53 17.8	0 59.3	63 38.7	49.0	231 15.0	05.9	169 34.7	48	26 22.6	− 70
18	67 44.7	63 05.1	+ 0 57.8	68 18.5	− 0 58.5	78 40.6	− 5 48.8	246 17.7	+ 2 06.0	183 58.5	47	−26 29.6	− 68
19	82 47.1	78 04.7	0 59.1	83 19.2	57.7	93 42.5	48.5	261 20.3	06.1	198 22.2	46	26 36.4	− 67
20	97 49.6	93 04.4	1 00.5	98 19.9	56.9	108 44.5	48.3	276 22.9	06.1	212 45.8	46	26 43.1	− 65
21	112 52.1	108 04.1	01.8	113 20.6	56.1	123 46.4	48.1	291 25.5	06.2	227 09.4	45	26 49.6	− 63
22	127 54.5	123 03.7	03.1	128 21.3	55.3	138 48.3	47.8	306 28.2	06.3	241 32.9	44	26 55.9	− 61
23	142 57.0	138 03.4	04.4	143 22.0	54.5	153 50.2	47.6	321 30.8	06.4	255 56.3	43	27 02.0	− 60
0	157 59.5	153 03.1	+ 1 05.7	158 22.7	− 0 53.7	168 52.1	− 5 47.4	336 33.4	+ 2 06.4	270 19.6	42	−27 08.0	− 57
1	173 01.9	168 02.7	07.0	173 23.3	53.0	183 54.0	47.1	351 36.0	06.5	284 42.8	42	27 13.7	− 56
2	188 04.4	183 02.4	08.3	188 24.0	52.2	198 55.9	46.9	6 38.7	06.6	299 06.0	41	27 19.3	− 54
3	203 06.9	198 02.1	09.6	203 24.7	51.4	213 57.8	46.7	21 41.3	06.7	313 29.1	41	27 24.7	− 53
4	218 09.3	213 01.7	10.9	218 25.4	50.6	228 59.7	46.4	36 43.9	06.8	327 52.2	39	27 30.0	− 50
5	233 11.8	228 01.4	12.2	233 26.1	49.8	244 01.6	46.2	51 46.5	06.8	342 15.1	39	27 35.0	− 49
6	248 14.2	243 01.1	+ 1 13.5	248 26.8	− 0 49.0	259 03.5	− 5 45.9	66 49.2	+ 2 06.9	356 38.0	39	−27 39.9	− 46
7	263 16.7	258 00.7	14.8	263 27.5	48.2	274 05.4	45.7	81 51.8	07.0	11 00.9	38	27 44.5	− 45
8	278 19.2	273 00.4	16.1	278 28.2	47.4	289 07.3	45.5	96 54.4	07.1	25 23.7	37	27 49.0	− 43
9	293 21.6	288 00.1	17.4	293 28.9	46.6	304 09.2	45.2	111 57.0	07.1	39 46.4	37	27 53.3	− 41
10	308 24.1	302 59.7	18.7	308 29.6	45.8	319 11.1	45.0	126 59.7	07.2	54 09.1	36	27 57.4	− 39
11	323 26.6	317 59.4	20.0	323 30.3	45.0	334 13.0	44.8	142 02.3	07.3	68 31.7	36	28 01.3	− 37
12	338 29.0	332 59.1	+ 1 21.3	338 31.1	− 0 44.2	349 15.0	− 5 44.5	157 04.9	+ 2 07.4	82 54.3	35	−28 05.0	− 36
13	353 31.5	347 58.8	22.6	353 31.8	43.4	4 16.9	44.3	172 07.5	07.4	97 16.8	34	28 08.6	− 33
14	8 34.0	2 58.4	23.9	8 32.5	42.6	19 18.8	44.1	187 10.2	07.5	111 39.2	35	28 11.9	− 32
15	23 36.4	17 58.1	25.2	23 33.2	41.8	34 20.7	43.8	202 12.8	07.6	126 01.7	33	28 15.1	− 29
16	38 38.9	32 57.8	26.5	38 33.9	41.1	49 22.6	43.6	217 15.4	07.7	140 24.0	34	28 18.0	− 28
17	53 41.4	47 57.4	27.8	53 34.6	40.3	64 24.5	43.4	232 18.0	07.7	154 46.4	33	28 20.8	− 25
18	68 43.8	62 57.1	+ 1 29.1	68 35.3	− 0 39.5	79 26.4	− 5 43.1	247 20.7	+ 2 07.8	169 08.7	33	−28 23.3	− 24
19	83 46.3	77 56.8	30.4	83 36.0	38.7	94 28.3	42.9	262 23.3	07.9	183 31.0	32	28 25.7	− 21
20	98 48.7	92 56.4	31.7	98 36.7	37.9	109 30.2	42.7	277 25.9	08.0	197 53.2	32	28 27.8	− 20
21	113 51.2	107 56.1	33.0	113 37.4	37.1	124 32.1	42.4	292 28.5	08.1	212 15.4	32	28 29.8	− 18
22	128 53.7	122 55.8	34.3	128 38.1	36.3	139 34.0	42.2	307 31.2	08.1	226 37.6	31	28 31.6	− 15
23	143 56.1	137 55.4	35.6	143 38.8	35.5	154 35.9	41.9	322 33.8	08.2	240 59.7	32	28 33.1	− 14
24	158 58.6	152 55.1	+ 1 36.9	158 39.5	− 0 34.7	169 37.8	− 5 41.7	337 36.4	+ 2 08.3	255 21.9	31	−28 34.5	− 12
code	—	− 4	+ 13	+ 7	+ 8	+ 19	+ 3	+ 26	+ 1				

GCT	SUN GHA	SUN Dec.
h	° ′	° ′
0	176 45.0	− 8 43.7
1	191 45.1	42.8
2	206 45.2	41.8
3	221 45.4	•• 40.9
4	236 45.5	40.0
5	251 45.6	39.0
6	266 45.7	− 8 38.1
7	281 45.8	37.2
8	296 45.9	36.2
9	311 46.0	•• 35.3
10	326 46.1	34.4
11	341 46.2	33.4
12	356 46.3	− 8 32.5
13	11 46.4	31.5
14	26 46.5	30.6
15	41 46.6	•• 29.7
16	56 46.8	28.7
17	71 46.9	27.8
18	86 47.0	− 8 26.9
19	101 47.1	25.9
20	116 47.2	25.0
21	131 47.3	•• 24.0
22	146 47.4	23.1
23	161 47.5	22.2
0	176 47.6	− 8 21.2
1	191 47.7	20.3
2	206 47.9	19.3
3	221 48.0	•• 18.4
4	236 48.1	17.5
5	251 48.2	16.5
6	266 48.3	− 8 15.6
7	281 48.4	14.6
8	296 48.5	13.7
9	311 48.6	•• 12.7
10	326 48.8	11.8
11	341 48.9	10.9
12	356 49.0	− 8 09.9
13	11 49.1	09.0
14	26 49.2	08.0
15	41 49.3	•• 07.1
16	56 49.4	06.1
17	71 49.6	05.2
18	86 49.7	− 8 04.3
19	101 49.8	03.3
20	116 49.9	02.4
21	131 50.0	•• 01.4
22	146 50.1	8 00.5
23	161 50.2	7 59.5
0	176 50.4	− 7 58.6
1	191 50.5	57.6
2	206 50.6	56.7
3	221 50.7	•• 55.8
4	236 50.8	54.8
5	251 50.9	53.9
6	266 51.1	− 7 52.9
7	281 51.2	52.0
8	296 51.3	51.0
9	311 51.4	•• 50.1
10	326 51.5	49.1
11	341 51.7	48.2
12	356 51.8	− 7 47.2
13	11 51.9	46.3
14	26 52.0	45.3
15	41 52.1	•• 44.4
16	56 52.3	43.4
17	71 52.4	42.5
18	86 52.5	− 7 41.5
19	101 52.6	40.6
20	116 52.7	39.6
21	131 52.9	•• 38.7
22	146 53.0	37.7
23	161 53.1	36.8
24	176 53.2	− 7 35.9
code	—	+ 9

STARS No.	SHA	Dec.	Transit Mer. Gr.
	° ′	° ′	h m
1	358 32.5	+28 49.2	13 36
2	358 22.4	+58 52.9	13 36
3	349 43.1	−18 15.4	14 11
4	339 21.6	+59 59.1	14 52
5	336 01.7	−57 29.2	15 05
6	332 56.1	+89 02.4	15 18
7	328 54.0	+23 14.0	15 34
8	315 53.9	−40 30.1	16 26
9	309 47.8	+49 41.6	16 50
10	291 43.2	+16 24.9	18 02
11	281 57.0	− 8 15.4	18 41
12	281 43.7	+45 57.3	18 42
13	279 22.2	+ 6 18.5	18 51
14	279 11.8	+28 34.3	18 52
15	276 33.9	− 1 13.9	19 03
16	271 51.9	+ 7 24.0	19 21
17	264 16.7	−52 40.2	19 52
18	259 14.8	−16 38.9	20 12
19	255 49.2	−28 54.4	20 25
20	245 48.5	+ 5 21.1	21 05
21	244 24.7	+28 08.9	21 11
22	234 36.9	−59 21.2	21 50
23	223 26.7	−43 14.2	22 34
24	221 49.3	−69 31.0	22 41
25	218 41.9	− 8 26.8	22 53
26	208 33.0	+12 12.3	23 34
27	194 48.0	+62 00.8	0 33
28	183 21.0	+14 50.5	1 18
29	174 01.6	−62 49.7	1 56
30	172 53.0	−56 50.4	2 00
31	168 46.9	−59 25.3	2 16
32	167 01.0	+56 13.2	2 24
33	159 29.9	+55 10.5	2 54
34	159 20.5	−10 54.6	2 54
35	153 35.2	+49 33.0	3 17
36	149 02.8	−36 07.9	3 35
37	146 38.2	+19 25.8	3 45
38	140 55.9	−60 38.1	4 08
39	137 16.7	+74 20.9	4 22
40	126 50.5	+26 52.3	5 04
41	120 38.3	−22 29.2	5 29
42	113 23.8	−26 19.6	5 57
43	109 07.9	−68 56.4	6 14
44	103 06.4	−15 40.2	6 38
45	97 25.7	−37 04.3	7 01
46	96 50.0	+12 35.3	7 03
47	91 08.1	+51 29.2	7 26
48	84 46.1	−34 24.7	7 52
49	81 10.9	+38 43.8	8 06
50	76 56.6	−26 21.7	8 23
51	62 54.2	+ 8 44.0	9 19
52	54 33.3	−56 53.6	9 52
53	50 04.0	+45 06.0	10 10
54	34 33.5	+ 9 38.8	11 12
55	28 42.8	−47 12.0	11 35
56	16 15.9	−29 53.0	12 25
57	14 25.4	+14 56.4	12 32

Lat.	Sunrise	Twlt. begins	Moonrise 27	28	1	2
N °	h m	h m	h m	h m	h m	h m
70	7 35	4 12	■	■	■	■
68	7 27	4 23	2 33	■	■	■
66	7 19	4 30	1 51	■	■	■
64	7 13	4 37	1 22	3 54	■	■
62	7 08	4 42	1 01	3 07	5 40	■
60	7 04	4 47	0 43	2 37	4 31	6 02
58	7 00	4 51	0 29	2 14	3 56	5 18
56	6 56	4 54	0 17	1 56	3 31	4 49
54	6 53	4 57	0 06	1 40	3 11	4 27
52	6 50	5 00	25 27	1 27	2 54	4 08
50	6 47	5 01	25 15	1 15	2 39	3 52
45	6 41	5 05	24 51	0 51	2 10	3 21
40	6 36	5 08	24 32	0 32	1 47	2 56
35	6 32	5 09	24 16	0 16	1 28	2 36
30	6 28	5 09	24 02	0 02	1 12	2 19
20	6 21	5 09	23 39	24 45	0 45	1 50
10	6 15	5 06	23 19	24 21	0 21	1 25
0	6 09	5 01	23 00	23 59	25 02	1 02
10	6 04	4 52	22 41	23 38	24 39	0 39
20	5 57	4 42	22 22	23 15	24 14	0 14
30	5 50	4 27	21 59	22 48	23 46	24 50
35	5 45	4 16	21 46	22 33	23 29	24 34
40	5 40	4 03	21 31	22 14	23 09	24 14
45	5 35	3 47	21 13	21 53	22 45	23 51
50	5 28	3 26	20 51	21 25	22 14	23 20
52	5 24	3 16	20 41	21 12	21 59	23 05
54	5 21	3 03	20 29	20 57	21 41	22 48
56	5 17	2 48	20 16	20 39	21 19	22 27
58	5 12	2 29	20 00	20 17	20 52	22 00
60	5 08	2 05	19 42	19 49	20 13	21 22
S						

Lat.	Sunset	Twlt. ends	Moonset 27	28	1	2
N °	h m	h m	h m	h m	h m	h m
70	16 52	20 20	■	■	■	■
68	17 00	20 09	5 42	■	■	■
66	17 07	20 00	6 26	■	■	■
64	17 13	19 53	6 56	6 21	■	■
62	17 19	19 48	7 18	7 09	6 39	■
60	17 23	19 42	7 37	7 40	7 51	8 32
58	17 27	19 38	7 52	8 03	8 26	9 16
56	17 31	19 35	8 05	8 22	8 52	9 45
54	17 34	19 32	8 17	8 38	9 13	10 08
52	17 37	19 29	8 27	8 52	9 30	10 26
50	17 39	19 27	8 36	9 04	9 45	10 42
45	17 45	19 23	8 55	9 29	10 15	11 14
40	17 50	19 20	9 11	9 49	10 38	11 38
35	17 54	19 18	9 24	10 06	10 57	11 58
30	17 58	19 18	9 36	10 21	11 14	12 15
20	18 05	19 18	9 56	10 46	11 42	12 44
10	18 10	19 20	10 14	11 07	12 06	13 09
0	18 16	19 25	10 31	11 28	12 29	13 32
10	18 22	19 33	10 47	11 48	12 52	13 55
20	18 28	19 43	11 05	12 10	13 16	14 20
30	18 35	19 57	11 26	12 35	13 44	14 48
35	18 40	20 08	11 38	12 50	14 01	15 05
40	18 44	20 19	11 52	13 08	14 20	15 25
45	18 50	20 35	12 09	13 29	14 44	15 49
50	18 57	20 56	12 29	13 55	15 14	16 19
52	19 00	21 06	12 39	14 08	15 30	16 35
54	19 04	21 19	12 50	14 23	15 47	16 52
56	19 07	21 33	13 03	14 41	16 09	17 14
58	19 12	21 51	13 18	15 02	16 36	17 41
60	19 16	22 13	13 35	15 29	17 14	18 19
S						

GCT	Equation of Time (App.—Mean) 27	28	1
h	m s	m s	m s
0	−13 00.1	−12 49.7	−12 38.8
6	−12 57.5	−12 47.0	−12 36.0
12	−12 55.0	−12 44.3	−12 33.1
18	−12 52.3	−12 41.6	−12 30.3
24	−12 49.7	−12 38.8	−12 27.4

GCT of Transit Meridian of Greenwich

DAY	Moon	Venus	Mars	Jupiter	Saturn
	h m	h m	h m	h m	h m
27	4 18	13 47	13 28	12 49	1 42
28	5 14	13 48	13 27	12 46	1 38
1	6 14	13 48	13 26	12 43	1 34
2	7 17	13 49	13 25	12 40	1 29

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb	Venus	Mars
°	′	′	′
0	0.5	0.1	0.1
30	0.5	0.1	0.1
45	0.5	0.1	0.0
60	0.5	0.0	0.0
75	0.5	0.0	0.0
90	0.5	0.0	0.0

Moon's Lower Limb
Add

Alt.	27	28	1
°	′	′	′
0	18.1	18.3	18.5
4	18.1	18.3	18.5
8	18.1	18.3	18.4
12	18.0	18.3	18.4
16	18.0	18.2	18.4
20	18.0	18.2	18.3
24	17.9	18.1	18.2
28	17.8	18.1	18.2
32	17.8	18.0	18.1
36	17.7	17.9	18.0
40	17.6	17.8	17.9
44	17.5	17.7	17.8
48	17.4	17.6	17.7
52	17.3	17.4	17.5
56	17.2	17.3	17.4
60	17.0	17.2	17.3
64	16.9	17.0	17.1
68	16.8	16.9	17.0
72	16.6	16.8	16.8
76	16.5	16.6	16.7
80	16.4	16.5	16.5
84	16.2	16.3	16.3
88	16.1	16.2	16.2
90			

Add to table, back cover

Moon's Upper Limb
Subtract

Alt.	27	28	1
°	′	′	′
0	14.1	14.0	13.9
4	14.1	14.0	13.9
8	14.1	14.0	13.9
12	14.2	14.0	13.9
16	14.2	14.1	14.0
20	14.2	14.1	14.0
24	14.3	14.2	14.1
28	14.4	14.2	14.2
32	14.4	14.3	14.3
36	14.5	14.4	14.4
40	14.6	14.5	14.5
44	14.7	14.6	14.6
48	14.8	14.7	14.7
52	14.9	14.9	14.8
56	15.0	15.0	15.0
60	15.2	15.1	15.1
64	15.3	15.3	15.2
68	15.4	15.4	15.4
72	15.5	15.5	15.5
76	15.7	15.7	15.7
80	15.8	15.8	15.9
84	16.0	16.0	16.0
88	16.1	16.1	16.1
90			

Subtract from table, back cover

Last Quarter 28

G C T	♈ GHA	VENUS −3.4 GHA	VENUS Dec.	MARS 1.5 GHA	MARS Dec.	JUPITER −1.6 GHA	JUPITER Dec.	SATURN 0.8 GHA	SATURN Dec.	MOON GHA	code	MOON Dec.	code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
0	158 58.6	152 55.1	+ 1 36.9	158 39.5	− 0 34.7	169 37.8	− 5 41.7	337 36.4	+ 2 08.3	255 21.9	31	−28 34.5	− 12
1	174 01.1	167 54.8	38.2	173 40.2	33.9	184 39.7	41.5	352 39.0	08.4	269 44.0	31	28 35.7	− 10
2	189 03.5	182 54.4	39.5	188 40.9	33.1	199 41.6	41.2	7 41.7	08.4	284 06.1	31	28 36.7	− 7
3	204 06.0	197 54.1	·· 40.9	203 41.6	·· 32.3	214 43.5	·· 41.0	22 44.3	·· 08.5	298 28.2	31	·28 37.4	− 6
4	219 08.5	212 53.8	42.2	218 42.3	31.5	229 45.4	40.8	37 46.9	08.6	312 50.3	30	28 38.0	− 4
5	234 10.9	227 53.4	43.5	233 43.0	30.7	244 47.4	40.5	52 49.5	08.7	327 12.3	31	28 38.4	− 2
6	249 13.4	242 53.1	+ 1 44.8	248 43.7	− 0 29.9	259 49.3	− 5 40.3	67 52.2	+ 2 08.7	341 34.4	30	−28 38.6	0
7	264 15.8	257 52.8	46.1	263 44.4	29.2	274 51.2	40.1	82 54.8	08.8	355 56.4	31	28 38.6	+ 3
8	279 18.3	272 52.4	47.4	278 45.1	28.4	289 53.1	39.8	97 57.4	08.9	10 18.5	30	28 38.3	+ 4
9	294 20.8	287 52.1	·· 48.7	293 45.8	·· 27.6	304 55.0	·· 39.6	113 00.0	·· 09.0	24 40.5	31	·28 37.9	+ 6
10	309 23.2	302 51.8	50.0	308 46.5	26.8	319 56.9	39.4	128 02.7	09.0	39 02.6	31	28 37.3	+ 8
11	324 25.7	317 51.5	51.3	323 47.2	26.0	334 58.8	39.1	143 05.3	09.1	53 24.7	31	28 36.5	+ 10
12	339 28.2	332 51.1	+ 1 52.6	338 47.9	− 0 25.2	350 00.7	− 5 38.9	158 07.9	+ 2 09.2	67 46.8	31	−28 35.5	+ 13
13	354 30.6	347 50.8	53.9	353 48.6	24.4	5 02.6	38.6	173 10.5	09.3	82 08.9	31	28 34.2	+ 14
14	9 33.1	2 50.5	55.2	8 49.3	23.6	20 04.5	38.4	188 13.2	09.4	96 31.0	31	28 32.8	+ 16
15	24 35.6	17 50.1	·· 56.5	23 50.0	·· 22.8	35 06.4	·· 38.2	203 15.8	·· 09.4	110 53.1	32	·28 31.2	+ 18
16	39 38.0	32 49.8	57.8	38 50.7	22.0	50 08.3	37.9	218 18.4	09.5	125 15.3	31	28 29.4	+ 20
17	54 40.5	47 49.5	1 59.1	53 51.4	21.2	65 10.2	37.7	233 21.1	09.6	139 37.4	32	28 27.4	+ 23
18	69 43.0	62 49.1	+ 2 00.4	68 52.1	− 0 20.4	80 12.1	− 5 37.5	248 23.7	+ 2 09.7	153 59.6	33	−28 25.1	+ 24
19	84 45.4	77 48.8	01.7	83 52.8	19.6	95 14.0	37.2	263 26.3	09.7	168 21.9	32	28 22.7	+ 26
20	99 47.9	92 48.5	03.0	98 53.5	18.9	110 15.9	37.0	278 28.9	09.8	182 44.1	33	28 20.1	+ 28
21	114 50.3	107 48.1	·· 04.3	113 54.2	·· 18.1	125 17.8	·· 36.8	293 31.6	·· 09.9	197 06.4	34	·28 17.3	+ 30
22	129 52.8	122 47.8	05.6	128 54.9	17.3	140 19.7	36.5	308 34.2	10.0	211 28.8	34	28 14.3	+ 32
23	144 55.3	137 47.5	06.9	143 55.6	16.5	155 21.7	36.3	323 36.8	10.1	225 51.2	34	28 11.1	+ 33
0	159 57.7	152 47.1	+ 2 08.2	158 56.3	− 0 15.7	170 23.6	− 5 36.1	338 39.4	+ 2 10.1	240 13.6	34	−28 07.8	+ 36
1	175 00.2	167 46.8	09.5	173 57.0	14.9	185 25.5	35.8	353 42.1	10.2	254 36.0	35	28 04.2	+ 38
2	190 02.7	182 46.5	10.8	188 57.7	14.1	200 27.4	35.6	8 44.7	10.3	268 58.5	36	28 00.4	+ 40
3	205 05.1	197 46.2	·· 12.1	203 58.4	·· 13.3	215 29.3	·· 35.3	23 47.3	·· 10.4	283 21.1	36	·27 56.4	+ 41
4	220 07.6	212 45.8	13.4	218 59.1	12.5	230 31.2	35.1	38 50.0	10.4	297 43.7	37	27 52.3	+ 44
5	235 10.1	227 45.5	14.7	233 59.8	11.7	245 33.1	34.9	53 52.6	10.5	312 06.4	37	27 47.9	+ 45
6	250 12.5	242 45.2	+ 2 16.0	249 00.5	− 0 10.9	260 35.0	− 5 34.6	68 55.2	+ 2 10.6	326 29.1	38	−27 43.4	+ 47
7	265 15.0	257 44.8	17.3	264 01.2	10.1	275 36.9	34.4	83 57.8	10.7	340 51.9	38	27 38.7	+ 50
8	280 17.5	272 44.5	18.6	279 01.9	09.3	290 38.8	34.2	99 00.5	10.7	355 14.7	39	27 33.7	+ 51
9	295 19.9	287 44.2	·· 19.9	294 02.6	·· 08.5	305 40.7	·· 33.9	114 03.1	·· 10.8	9 37.6	40	·27 28.6	+ 52
10	310 22.4	302 43.8	21.2	309 03.3	07.8	320 42.6	33.7	129 05.7	10.9	24 00.6	40	27 23.4	+ 55
11	325 24.8	317 43.5	22.5	324 04.0	07.0	335 44.5	33.5	144 08.4	11.0	38 23.6	41	27 17.9	+ 57
12	340 27.3	332 43.2	+ 2 23.8	339 04.7	− 0 06.2	350 46.4	− 5 33.2	159 11.0	+ 2 11.1	52 46.7	42	−27 12.2	+ 58
13	355 29.8	347 42.8	25.1	354 05.4	05.4	5 48.3	33.0	174 13.6	11.1	67 09.9	43	27 06.4	+ 60
14	10 32.2	2 42.5	26.4	9 06.1	04.6	20 50.2	32.8	189 16.2	11.2	81 33.2	43	27 00.4	+ 62
15	25 34.7	17 42.2	·· 27.7	24 06.8	·· 03.8	35 52.1	·· 32.5	204 18.9	·· 11.3	95 56.5	44	·26 54.2	+ 64
16	40 37.2	32 41.8	29.0	39 07.5	03.0	50 54.0	32.3	219 21.5	11.4	110 19.9	45	26 47.8	+ 65
17	55 39.6	47 41.5	30.3	54 08.3	02.2	65 55.9	32.0	234 24.1	11.4	124 43.4	46	26 41.3	+ 68
18	70 42.1	62 41.2	+ 2 31.6	69 09.0	− 0 01.4	80 57.9	− 5 31.8	249 26.8	+ 2 11.5	139 07.0	46	−26 34.5	+ 69
19	85 44.6	77 40.9	32.9	84 09.7	− 0 00.6	95 59.8	31.6	264 29.4	11.6	153 30.6	47	26 27.6	+ 71
20	100 47.0	92 40.5	34.2	99 10.4	+ 0 00.2	111 01.7	31.3	279 32.0	11.7	167 54.3	48	26 20.5	+ 72
21	115 49.5	107 40.2	·· 35.5	114 11.1	·· 01.0	126 03.6	·· 31.1	294 34.6	·· 11.8	182 18.1	49	·26 13.3	+ 74
22	130 52.0	122 39.9	36.8	129 11.8	01.7	141 05.5	30.9	309 37.3	11.8	196 42.0	50	26 05.9	+ 76
23	145 54.4	137 39.5	38.1	144 12.5	02.5	156 07.4	30.6	324 39.9	11.9	211 06.0	51	25 58.3	+ 78
0	160 56.9	152 39.2	+ 2 39.4	159 13.2	+ 0 03.3	171 09.3	− 5 30.4	339 42.5	+ 2 12.0	225 30.1	52	−25 50.5	+ 79
1	175 59.3	167 38.9	40.7	174 13.9	04.1	186 11.2	30.2	354 45.2	12.1	239 54.3	52	25 42.6	+ 81
2	191 01.8	182 38.5	42.0	189 14.6	04.9	201 13.1	29.9	9 47.8	12.1	254 18.5	54	25 34.5	+ 83
3	206 04.3	197 38.2	·· 43.3	204 15.3	·· 05.7	216 15.0	·· 29.7	24 50.4	·· 12.2	268 42.9	55	·25 26.2	+ 84
4	221 06.7	212 37.9	44.6	219 16.0	06.5	231 16.9	29.4	39 53.1	12.3	283 07.4	55	25 17.8	+ 85
5	236 09.2	227 37.5	45.9	234 16.7	07.3	246 18.8	29.2	54 55.7	12.4	297 31.9	56	25 09.3	+ 88
6	251 11.7	242 37.2	+ 2 47.2	249 17.4	+ 0 08.1	261 20.7	− 5 29.0	69 58.3	+ 2 12.5	311 56.5	58	−25 00.5	+ 89
7	266 14.1	257 36.9	48.5	264 18.1	08.9	276 22.6	28.7	85 00.9	12.5	326 21.3	58	24 51.6	+ 90
8	281 16.6	272 36.5	49.8	279 18.8	09.7	291 24.5	28.5	100 03.6	12.6	340 46.1	60	24 42.6	+ 92
9	296 19.1	287 36.2	·· 51.1	294 19.5	·· 10.5	306 26.4	·· 28.3	115 06.2	·· 12.7	355 11.1	60	·24 33.4	+ 94
10	311 21.5	302 35.9	52.4	309 20.2	11.2	321 28.3	28.0	130 08.8	12.8	9 36.1	62	24 24.0	+ 95
11	326 24.0	317 35.5	53.7	324 20.9	12.0	336 30.2	27.8	145 11.5	12.8	24 01.3	62	24 14.5	+ 96
12	341 26.5	332 35.2	+ 2 55.0	339 21.6	+ 0 12.8	351 32.1	− 5 27.6	160 14.1	+ 2 12.9	38 26.5	64	−24 04.9	+ 98
13	356 28.9	347 34.9	56.3	354 22.3	13.6	6 34.1	27.3	175 16.7	13.0	52 51.9	64	23 55.1	+100
14	11 31.4	2 34.6	57.6	9 23.0	14.4	21 36.0	27.1	190 19.4	13.1	67 17.3	66	23 45.1	+101
15	26 33.8	17 34.2	· 2 58.9	24 23.7	·· 15.2	36 37.9	·· 26.8	205 22.0	·· 13.2	81 42.9	66	·23 35.0	+102
16	41 36.3	32 33.9	3 00.2	39 24.4	16.0	51 39.8	26.6	220 24.6	13.2	96 08.5	68	23 24.8	+104
17	56 38.8	47 33.6	01.5	54 25.1	16.8	66 41.7	26.4	235 27.2	13.3	110 34.3	69	23 14.4	+105
18	71 41.2	62 33.2	+ 3 02.8	69 25.8	+ 0 17.6	81 43.6	− 5 26.1	250 29.9	+ 2 13.4	125 00.2	70	−23 03.9	+106
19	86 43.7	77 32.9	04.1	84 26.6	18.4	96 45.5	25.9	265 32.5	13.5	139 26.2	71	22 53.3	+108
20	101 46.2	92 32.6	05.4	99 27.3	19.2	111 47.4	25.7	280 35.1	13.6	153 52.3	72	22 42.5	+109
21	116 48.6	107 32.2	·· 06.7	114 28.0	·· 20.0	126 49.3	·· 25.4	295 37.8	·· 13.6	168 18.5	73	·22 31.6	+111
22	131 51.1	122 31.9	08.0	129 28.7	20.7	141 51.2	25.2	310 40.4	13.7	182 44.8	74	22 20.5	+112
23	146 53.6	137 31.6	09.3	144 29.4	21.5	156 53.1	25.0	325 43.0	13.8	197 11.2	75	22 09.3	+113
24	161 56.0	152 31.2	+ 3 10.6	159 30.1	+ 0 22.3	171 55.0	− 5 24.7	340 45.7	+ 2 13.9	211 37.7	76	−21 58.0	+114
code	—	− 4	+ 13	+ 7	+ 8	+ 19	+ 2	+ 26	0				

GCT h	SUN GHA ° ′	Dec. ° ′
2		
0	176 53.2	− 7 35.9
1	191 53.3	34.9
2	206 53.5	33.9
3	221 53.6	·· 33.0
4	236 53.7	32.0
5	251 53.8	31.1
6	266 54.0	− 7 30.1
7	281 54.1	29.2
8	296 54.2	28.2
9	311 54.3	·· 27.3
10	326 54.4	26.3
11	341 54.6	25.4
12	356 54.7	− 7 24.4
13	11 54.8	23.5
14	26 54.9	22.5
15	41 55.1	·· 21.6
16	56 55.2	20.6
17	71 55.3	19.7
18	86 55.4	− 7 18.7
19	101 55.6	17.8
20	116 55.7	16.8
21	131 55.8	·· 15.9
22	146 55.9	14.9
23	161 56.1	13.9
3		
0	176 56.2	− 7 13.0
1	191 56.3	12.0
2	206 56.5	11.1
3	221 56.6	·· 10.1
4	236 56.7	09.2
5	251 56.8	08.2
6	266 57.0	− 7 07.3
7	281 57.1	06.3
8	296 57.2	05.4
9	311 57.3	·· 04.4
10	326 57.5	03.4
11	341 57.6	02.5
12	356 57.7	− 7 01.5
13	11 57.9	7 00.6
14	26 58.0	6 59.6
15	41 58.1	·· 58.7
16	56 58.3	57.7
17	71 58.4	56.7
18	86 58.5	− 6 55.8
19	101 58.6	54.8
20	116 58.8	53.9
21	131 58.9	·· 52.9
22	146 59.0	52.0
23	161 59.2	51.0
4		
0	176 59.3	− 6 50.0
1	191 59.4	49.1
2	206 59.6	48.1
3	221 59.7	·· 47.2
4	236 59.8	46.2
5	252 00.0	45.2
6	267 00.1	− 6 44.3
7	282 00.2	43.3
8	297 00.4	42.4
9	312 00.5	·· 41.4
10	327 00.6	40.4
11	342 00.8	39.5
12	357 00.9	− 6 38.5
13	12 01.0	37.6
14	27 01.2	36.6
15	42 01.3	·· 35.6
16	57 01.4	34.7
17	72 01.6	33.7
18	87 01.7	− 6 32.8
19	102 01.8	31.8
20	117 02.0	30.8
21	132 02.1	·· 29.9
22	147 02.2	28.9
23	162 02.4	27.9
24	177 02.5	− 6 27.0
code	—	+ 9

STARS No.	SHA ° ′	Dec. ° ′	Transit Mer. Gr. h m
1	358 32.5	+28 49.2	13 24
2	358 22.4	+58 52.9	13 24
3	349 43.1	−18 15.4	13 59
4	339 21.6	+59 59.1	14 40
5	336 01.7	−57 29.2	14 54
6	332 56.8	+89 02.4	15 06
7	328 54.0	+23 14.0	15 22
8	315 53.9	−40 30.1	16 14
9	309 47.8	+49 41.6	16 38
10	291 43.2	+16 24.9	17 50
11	281 57.1	− 8 15.4	18 29
12	281 43.7	+45 57.3	18 30
13	279 22.2	+ 6 18.5	18 40
14	279 11.8	+28 34.3	18 40
15	276 33.9	− 1 13.9	18 51
16	271 51.9	+ 7 24.0	19 10
17	264 16.8	−52 40.2	19 40
18	259 14.9	−16 38.9	20 00
19	255 49.2	−28 54.4	20 14
20	245 48.5	+ 5 21.1	20 53
21	244 24.7	+28 08.9	20 59
22	234 36.9	−59 21.2	21 38
23	223 26.7	−43 14.2	22 23
24	221 49.4	−69 31.0	22 29
25	218 41.9	− 8 26.8	22 42
26	208 33.0	+12 12.3	23 22
27	194 48.0	+62 00.8	0 21
28	183 21.0	+14 50.5	1 07
29	174 01.6	−62 49.7	1 44
30	172 53.0	−56 50.4	1 48
31	168 46.9	−59 25.3	2 05
32	167 00.9	+56 13.2	2 12
33	159 29.9	+55 10.5	2 42
34	159 20.5	−10 54.6	2 42
35	153 35.2	+49 33.0	3 05
36	149 02.8	−36 07.9	3 23
37	146 38.2	+19 25.8	3 33
38	140 55.8	−60 38.1	3 56
39	137 16.7	+74 20.9	4 10
40	126 50.5	+26 52.3	4 52
41	120 38.3	−22 29.2	5 17
42	113 23.8	−26 19.7	5 46
43	109 07.9	−68 56.4	6 03
44	103 06.4	−15 40.2	6 27
45	97 25.7	−37 04.3	6 49
46	96 50.0	+12 35.3	6 52
47	91 08.1	+51 29.2	7 14
48	84 46.1	−34 24.7	7 40
49	81 10.9	+38 43.8	7 54
50	76 56.5	−26 21.7	8 11
51	62 54.2	+ 8 44.0	9 07
52	54 33.3	−56 53.6	9 40
53	50 04.0	+45 06.0	9 58
54	34 33.5	+ 9 38.8	11 00
55	28 42.8	−47 12.0	11 23
56	16 15.9	−29 53.0	12 13
57	14 25.4	+14 56.4	12 20

Lat. °	Sunrise h m	Twlt. begins h m	Moonrise 2 h m	3 h m	4 h m	5 h m
N 70	7 21	3 57	■	■	■	■
68	7 14	4 09	■	■	■	8 40
66	7 08	4 19	■	■	■	8 00
64	7 03	4 27	■	■	8 04	7 32
62	6 59	4 33	■	7 43	7 20	7 11
60	6 55	4 39	6 02	6 40	6 50	6 53
58	6 51	4 43	5 18	6 06	6 28	6 38
56	6 48	4 47	4 49	5 40	6 09	6 25
54	6 46	4 50	4 27	5 20	5 54	6 14
52	6 43	4 53	4 08	5 03	5 40	6 04
50	6 41	4 55	3 52	4 48	5 28	5 55
45	6 36	5 00	3 21	4 19	5 03	5 36
40	6 32	5 03	2 56	3 55	4 43	5 21
35	6 28	5 05	2 36	3 36	4 27	5 08
30	6 25	5 06	2 19	3 20	4 12	4 56
20	6 19	5 07	1 50	2 52	3 48	4 37
10	6 14	5 04	1 25	2 27	3 26	4 19
0	6 09	5 00	1 02	2 05	3 06	4 03
10	6 04	4 53	0 39	1 43	2 46	3 47
20	5 58	4 43	0 14	1 18	2 25	3 29
30	5 52	4 29	24 50	0 50	1 59	3 09
35	5 48	4 20	24 34	0 34	1 45	2 57
40	5 44	4 09	24 14	0 14	1 27	2 43
45	5 39	3 53	23 51	25 07	1 07	2 27
50	5 33	3 33	23 20	24 41	0 41	2 07
52	5 30	3 23	23 05	24 28	0 28	1 57
54	5 27	3 12	22 48	24 13	0 13	1 46
56	5 24	2 59	22 27	23 56	25 34	1 34
58	5 20	2 43	22 00	23 35	25 20	1 20
60	5 16	2 21	21 22	23 09	25 03	1 03
S						

Lat. °	Sunset h m	Twlt. ends h m	Moonset 2 h m	3 h m	4 h m	5 h m
N 70	17 05	20 34	■	■	■	■
68	17 12	20 21	■	■	■	12 12
66	17 18	20 11	■	■	■	12 50
64	17 23	20 03	■	■	10 49	13 17
62	17 27	19 56	■	9 04	11 33	13 38
60	17 31	19 50	8 32	10 06	12 01	13 54
58	17 34	19 45	9 16	10 40	12 23	14 08
56	17 37	19 41	9 45	11 05	12 41	14 20
54	17 40	19 38	10 08	11 25	12 56	14 31
52	17 42	19 34	10 26	11 42	13 09	14 40
50	17 44	19 32	10 42	11 56	13 21	14 48
45	17 49	19 27	11 14	12 25	13 45	15 05
40	17 53	19 23	11 38	12 48	14 03	15 19
35	17 57	19 21	11 58	13 07	14 19	15 31
30	18 00	19 20	12 15	13 23	14 33	15 42
20	18 06	19 19	12 44	13 50	14 56	15 59
10	18 11	19 21	13 09	14 13	15 15	16 15
0	18 16	19 25	13 32	14 34	15 34	16 29
10	18 20	19 31	13 55	14 56	15 52	16 43
20	18 26	19 40	14 20	15 19	16 11	16 58
30	18 32	19 54	14 48	15 45	16 34	17 14
35	18 35	20 02	15 05	16 01	16 46	17 24
40	18 40	20 14	15 25	16 19	17 01	17 35
45	18 44	20 28	15 49	16 40	17 19	17 48
50	18 50	20 47	16 19	17 07	17 40	18 04
52	18 53	20 57	16 35	17 20	17 51	18 11
54	18 56	21 08	16 52	17 35	18 02	18 19
56	18 59	21 21	17 14	17 53	18 15	18 28
58	19 03	21 37	17 41	18 14	18 30	18 39
60	19 07	21 56	18 19	18 41	18 48	18 50
S						

GCT h	Equation of Time (App.—Mean) 2 m s	3 m s	4 m s
0	−12 27.4	−12 15.5	−12 03.1
6	−12 24.4	−12 12.4	−11 59.9
12	−12 21.5	−12 09.3	−11 56.7
18	−12 18.5	−12 06.2	−11 53.5
24	−12 15.5	−12 03.1	−11 50.2

GCT of Transit Meridian of Greenwich

DAY	Moon h m	Venus h m	Mars h m	Jupiter h m	Saturn h m
2	7 17	13 49	13 25	12 40	1 29
3	8 20	13 49	13 24	12 37	1 25
4	9 20	13 50	13 23	12 34	1 21
5	10 16	13 50	13 21	12 31	1 17

ADDITIONAL ALTITUDE CORRECTIONS

Alt. °	Sun's Low'r Limb ′	Venus ′	Mars ′
0–30	0.5	0.1	0.1
30–45	0.5	0.1	0.1
45–60	0.5	0.1	0.0
60–75	0.5	0.0	0.0
75–90	0.5	0.0	0.0

Moon's Lower Limb
Add

Alt. °	2 ′	3 ′	4 ′
0–4	18.5	18.3	18.2
4–8	18.5	18.3	18.2
8–12	18.4	18.3	18.2
12–16	18.4	18.3	18.2
16–20	18.4	18.2	18.1
20–24	18.3	18.2	18.1
24–28	18.2	18.1	18.0
28–32	18.2	18.1	17.9
32–36	18.1	18.0	17.9
36–40	18.0	17.9	17.8
40–44	17.9	17.8	17.7
44–48	17.8	17.7	17.6
48–52	17.7	17.6	17.5
52–56	17.5	17.4	17.4
56–60	17.4	17.3	17.2
60–64	17.3	17.2	17.1
64–68	17.1	17.0	17.0
68–72	17.0	16.9	16.8
72–76	16.8	16.8	16.7
76–80	16.7	16.6	16.6
80–84	16.5	16.5	16.4
84–88	16.3	16.3	16.3
88–90	16.2	16.2	16.2

Add to table, back cover

Moon's Upper Limb
Subtract

Alt. °	2 ′	3 ′	4 ′
0–4	13.9	14.0	14.0
4–8	13.9	14.0	14.0
8–12	13.9	14.0	14.1
12–16	13.9	14.0	14.1
16–20	14.0	14.1	14.1
20–24	14.0	14.1	14.2
24–28	14.1	14.2	14.2
28–32	14.2	14.2	14.3
32–36	14.3	14.3	14.4
36–40	14.4	14.4	14.5
40–44	14.5	14.5	14.6
44–48	14.6	14.6	14.7
48–52	14.7	14.7	14.8
52–56	14.8	14.9	14.9
56–60	15.0	15.0	15.0
60–64	15.1	15.1	15.1
64–68	15.2	15.3	15.3
68–72	15.4	15.4	15.4
72–76	15.5	15.5	15.5
76–80	15.7	15.7	15.7
80–84	15.9	15.8	15.8
84–88	16.0	16.0	16.0
88–90	16.1	16.1	16.1

Subtract from table, back cover

G C T	♈ GHA	VENUS −3.4 GHA	VENUS Dec.	MARS 1.5 GHA	MARS Dec.	JUPITER −1.6 GHA	JUPITER Dec.	SATURN 0.8 GHA	SATURN Dec.	MOON GHA	code	MOON Dec.	code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
0	161 56.0	152 31.2	+ 3 10.6	159 30.1	+ 0 22.3	171 55.0	− 5 24.7	340 45.7	+ 2 13.9	211 37.7	76	−21 58.0	+114
1	176 58.5	167 30.9	11.9	174 30.8	23.1	186 56.9	24.5	355 48.3	13.9	226 04.3	78	21 46.6	+116
2	192 00.9	182 30.6	13.2	189 31.5	23.9	201 58.8	24.2	10 50.9	14.0	240 31.1	78	21 35.0	+116
3	207 03.4	197 30.2	14.5	204 32.2	24.7	217 00.7	24.0	25 53.6	14.1	254 57.9	80	21 23.4	+118
4	222 05.9	212 29.9	15.8	219 32.9	25.5	232 02.6	23.8	40 56.2	14.2	269 24.9	80	21 11.6	+120
5	237 08.3	227 29.6	17.1	234 33.6	26.3	247 04.5	23.5	55 58.8	14.3	283 51.9	82	20 59.6	+120
6	252 10.8	242 29.2	+ 3 18.3	249 34.3	+ 0 27.1	262 06.4	− 5 23.3	71 01.4	+ 2 14.3	298 19.1	83	−20 47.6	+121
7	267 13.3	257 28.9	19.6	264 35.0	27.9	277 08.3	23.1	86 04.1	14.4	312 46.4	83	20 35.5	+123
8	282 15.7	272 28.6	20.9	279 35.7	28.6	292 10.2	22.8	101 06.7	14.5	327 13.7	85	20 23.2	+124
9	297 18.2	287 28.2	22.2	294 36.4	29.4	307 12.1	22.6	116 09.3	14.6	341 41.2	86	20 10.8	+125
10	312 20.7	302 27.9	23.5	309 37.1	30.2	322 14.1	22.4	131 12.0	14.6	356 08.8	87	19 58.3	+126
11	327 23.1	317 27.6	24.8	324 37.8	31.0	337 16.0	22.1	146 14.6	14.7	10 36.5	88	19 45.7	+127
12	342 25.6	332 27.2	+ 3 26.1	339 38.5	+ 0 31.8	352 17.9	− 5 21.9	161 17.2	+ 2 14.8	25 04.3	90	−19 33.0	+128
13	357 28.1	347 26.9	27.4	354 39.2	32.6	7 19.8	21.6	176 19.9	14.9	39 32.3	90	19 20.2	+129
14	12 30.5	2 26.6	28.7	9 39.9	33.4	22 21.7	21.4	191 22.5	15.0	54 00.3	91	19 07.3	+130
15	27 33.0	17 26.3	30.0	24 40.7	34.2	37 23.6	21.2	206 25.1	15.0	68 28.4	93	18 54.3	+131
16	42 35.4	32 25.9	31.3	39 41.4	35.0	52 25.5	20.9	221 27.8	15.1	82 56.7	93	18 41.2	+132
17	57 37.9	47 25.6	32.6	54 42.1	35.8	67 27.4	20.7	236 30.4	15.2	97 25.0	94	18 28.0	+133
18	72 40.4	62 25.3	+ 3 33.9	69 42.8	+ 0 36.6	82 29.3	− 5 20.5	251 33.0	+ 2 15.3	111 53.4	96	−18 14.7	+134
19	87 42.8	77 24.9	35.2	84 43.5	37.3	97 31.2	20.2	266 35.7	15.4	126 22.0	96	18 01.3	+135
20	102 45.3	92 24.6	36.5	99 44.2	38.1	112 33.1	20.0	281 38.3	15.4	140 50.6	98	17 47.8	+135
21	117 47.8	107 24.3	37.8	114 44.9	38.9	127 35.0	19.8	296 40.9	15.5	155 19.4	98	17 34.3	+137
22	132 50.2	122 23.9	39.1	129 45.6	39.7	142 36.9	19.5	311 43.6	15.6	169 48.2	100	17 20.6	+138
23	147 52.7	137 23.6	40.4	144 46.3	40.5	157 38.8	19.3	326 46.2	15.7	184 17.2	100	17 06.8	+138
0	162 55.2	152 23.3	+ 3 41.7	159 47.0	+ 0 41.3	172 40.7	− 5 19.0	341 48.8	+ 2 15.7	198 46.2	102	−16 53.0	+139
1	177 57.6	167 22.9	43.0	174 47.7	42.1	187 42.6	18.8	356 51.5	15.8	213 15.4	102	16 39.1	+140
2	193 00.1	182 22.6	44.3	189 48.4	42.9	202 44.5	18.6	11 54.1	15.9	227 44.6	104	16 25.1	+141
3	208 02.6	197 22.3	45.5	204 49.1	43.7	217 46.4	18.3	26 56.7	16.0	242 14.0	104	16 11.0	+141
4	223 05.0	212 21.9	46.8	219 49.8	44.5	232 48.3	18.1	41 59.4	16.1	256 43.4	106	15 56.9	+143
5	238 07.5	227 21.6	48.1	234 50.5	45.2	247 50.2	17.9	57 02.0	16.1	271 13.0	106	15 42.6	+143
6	253 09.9	242 21.3	+ 3 49.4	249 51.2	+ 0 46.0	262 52.1	− 5 17.6	72 04.6	+ 2 16.2	285 42.6	107	−15 28.3	+143
7	268 12.4	257 20.9	50.7	264 51.9	46.8	277 54.1	17.4	87 07.3	16.3	300 12.3	109	15 14.0	+145
8	283 14.9	272 20.6	52.0	279 52.7	47.6	292 56.0	17.2	102 09.9	16.4	314 42.2	109	14 59.5	+145
9	298 17.3	287 20.3	53.3	294 53.4	48.4	307 57.9	16.9	117 12.5	16.5	329 12.1	110	14 45.0	+146
10	313 19.8	302 19.9	54.6	309 54.1	49.2	322 59.8	16.7	132 15.2	16.5	343 42.1	111	14 30.4	+146
11	328 22.3	317 19.6	55.9	324 54.8	50.0	338 01.7	16.4	147 17.8	16.6	358 12.2	112	14 15.8	+147
12	343 24.7	332 19.3	+ 3 57.2	339 55.5	+ 0 50.8	353 03.6	− 5 16.2	162 20.4	+ 2 16.7	12 42.4	113	−14 01.1	+148
13	358 27.2	347 18.9	58.5	354 56.2	51.6	8 05.5	16.0	177 23.1	16.8	27 12.7	113	13 46.3	+148
14	13 29.7	2 18.6	3 59.8	9 56.9	52.4	23 07.4	15.7	192 25.7	16.9	41 43.0	115	13 31.5	+149
15	28 32.1	17 18.3	4 01.1	24 57.6	53.1	38 09.3	15.5	207 28.3	16.9	56 13.5	115	13 16.6	+150
16	43 34.6	32 17.9	02.4	39 58.3	53.9	53 11.2	15.3	222 31.0	17.0	70 44.0	117	13 01.6	+150
17	58 37.0	47 17.6	03.7	54 59.0	54.7	68 13.1	15.0	237 33.6	17.1	85 14.7	117	12 46.6	+150
18	73 39.5	62 17.2	+ 4 04.9	69 59.7	+ 0 55.5	83 15.0	− 5 14.8	252 36.2	+ 2 17.2	99 45.4	118	−12 31.6	+151
19	88 42.0	77 16.9	06.2	85 00.4	56.3	98 16.9	14.5	267 38.9	17.2	114 16.2	118	12 16.5	+152
20	103 44.4	92 16.6	07.5	100 01.1	57.1	113 18.8	14.3	282 41.5	17.3	128 47.0	120	12 01.3	+152
21	118 46.9	107 16.2	08.8	115 01.8	57.9	128 20.7	14.1	297 44.1	17.4	143 18.0	120	11 46.1	+152
22	133 49.4	122 15.9	10.1	130 02.5	58.7	143 22.6	13.8	312 46.8	17.5	157 49.0	122	11 30.9	+153
23	148 51.8	137 15.6	11.4	145 03.2	0 59.5	158 24.5	13.6	327 49.4	17.6	172 20.2	121	11 15.6	+154
0	163 54.3	152 15.2	+ 4 12.7	160 04.0	+ 1 00.2	173 26.4	− 5 13.4	342 52.0	+ 2 17.6	186 51.3	123	−11 00.2	+153
1	178 56.8	167 14.9	14.0	175 04.7	01.0	188 28.3	13.1	357 54.7	17.7	201 22.6	124	10 44.9	+155
2	193 59.2	182 14.6	15.3	190 05.4	01.8	203 30.2	12.9	12 57.3	17.8	215 54.0	124	10 29.4	+154
3	209 01.7	197 14.2	16.6	205 06.1	02.6	218 32.1	12.7	27 59.9	17.9	230 25.4	125	10 14.0	+155
4	224 04.2	212 13.9	17.9	220 06.8	03.4	233 34.0	12.4	43 02.6	18.0	244 56.9	126	9 58.5	+156
5	239 06.6	227 13.6	19.1	235 07.5	04.2	248 35.9	12.2	58 05.2	18.0	259 28.5	126	9 42.9	+155
6	254 09.1	242 13.2	+ 4 20.4	250 08.2	+ 1 05.0	263 37.9	− 5 11.9	73 07.8	+ 2 18.1	274 00.1	127	− 9 27.4	+156
7	269 11.5	257 12.9	21.7	265 08.9	05.8	278 39.8	11.7	88 10.5	18.2	288 31.8	128	9 11.8	+157
8	284 14.0	272 12.6	23.0	280 09.6	06.5	293 41.7	11.5	103 13.1	18.3	303 03.6	128	8 56.1	+156
9	299 16.5	287 12.2	24.3	295 10.3	07.3	308 43.6	11.2	118 15.7	18.4	317 35.4	129	8 40.5	+157
10	314 18.9	302 11.9	25.6	310 11.0	08.1	323 45.5	11.0	133 18.4	18.4	332 07.3	130	8 24.8	+158
11	329 21.4	317 11.6	26.9	325 11.7	08.9	338 47.4	10.8	148 21.0	18.5	346 39.3	130	8 09.0	+157
12	344 23.9	332 11.2	+ 4 28.2	340 12.4	+ 1 09.7	353 49.3	− 5 10.5	163 23.6	+ 2 18.6	1 11.3	132	− 7 53.3	+158
13	359 26.3	347 10.9	29.5	355 13.1	10.5	8 51.2	10.3	178 26.3	18.7	15 43.5	131	7 37.5	+158
14	14 28.8	2 10.6	30.8	10 13.9	11.3	23 53.1	10.0	193 28.9	18.8	30 15.6	132	7 21.7	+158
15	29 31.3	17 10.2	32.0	25 14.6	12.1	38 55.0	09.8	208 31.5	18.8	44 47.8	133	7 05.9	+158
16	44 33.7	32 09.9	33.3	40 15.3	12.9	53 56.9	09.6	223 34.2	18.9	59 20.1	134	6 50.1	+159
17	59 36.2	47 09.5	34.6	55 16.0	13.6	68 58.8	09.3	238 36.8	19.0	73 52.5	134	6 34.2	+158
18	74 38.7	62 09.2	+ 4 35.9	70 16.7	+ 1 14.4	84 00.7	− 5 09.1	253 39.5	+ 2 19.1	88 24.9	134	− 6 18.4	+159
19	89 41.1	77 08.9	37.2	85 17.4	15.2	99 02.6	08.9	268 42.1	19.2	Sun partially eclipsed,			
20	104 43.6	92 08.5	38.5	100 18.1	16.0	114 04.5	08.6	283 44.7	19.2	South Pacific—annular path			
21	119 46.0	107 08.2	39.8	115 18.8	16.8	129 06.4	08.4	298 47.4	19.3	New Zealand to Nicaragua			
22	134 48.5	122 07.9	41.1	130 19.5	17.6	144 08.3	08.2	313 50.0	19.4				
23	149 51.0	137 07.5	42.3	145 20.2	18.4	159 10.2	07.9	328 52.6	19.5				
24	164 53.4	152 07.2	+ 4 43.6	160 20.9	+ 1 19.2	174 12.1	− 5 07.7	343 55.3	+ 2 19.5	175 40.4	138	− 4 42.9	+159
code	—	− 4	+ 13	+ 7	+ 8	+ 19	+ 2	+ 27	+ 1				

GCT h	SUN GHA ° ′	SUN Dec. ° ′
0	177 02.5	− 6 27.0
1	192 02.6	26.0
2	207 02.8	25.1
3	222 02.9	•• 24.1
4	237 03.1	23.1
5	252 03.2	22.2
6	267 03.3	− 6 21.2
7	282 03.5	20.2
8	297 03.6	19.3
9	312 03.7	•• 18.3
10	327 03.9	17.3
11	342 04.0	16.4
12	357 04.2	− 6 15.4
13	12 04.3	14.5
14	27 04.4	13.5
15	42 04.6	•• 12.5
16	57 04.7	11.6
17	72 04.9	10.6
18	87 05.0	− 6 09.6
19	102 05.1	08.7
20	117 05.3	07.7
21	132 05.4	•• 06.7
22	147 05.6	05.8
23	162 05.7	04.8
0	177 05.8	− 6 03.8
1	192 06.0	02.9
2	207 06.1	01.9
3	222 06.3	•• 00.9
4	237 06.4	6 00.0
5	252 06.5	5 59.0
6	267 06.7	− 5 58.0
7	282 06.8	57.1
8	297 07.0	56.1
9	312 07.1	•• 55.1
10	327 07.2	54.2
11	342 07.4	53.2
12	357 07.5	− 5 52.2
13	12 07.7	51.3
14	27 07.8	50.3
15	42 08.0	•• 49.3
16	57 08.1	48.4
17	72 08.2	47.4
18	87 08.4	− 5 46.4
19	102 08.5	45.4
20	117 08.7	44.5
21	132 08.8	•• 43.5
22	147 09.0	42.5
23	162 09.1	41.6
0	177 09.3	− 5 40.6
1	192 09.4	39.6
2	207 09.6	38.7
3	222 09.7	•• 37.7
4	237 09.8	36.7
5	252 10.0	35.8
6	267 10.1	− 5 34.8
7	282 10.3	33.8
8	297 10.4	32.8
9	312 10.6	•• 31.9
10	327 10.7	30.9
11	342 10.9	29.9
12	357 11.0	− 5 29.0
13	12 11.2	28.0
14	27 11.3	27.0
15	42 11.5	•• 26.0
16	57 11.6	25.1
17	72 11.8	24.1
18	87 11.9	− 5 23.1
19	102 12.1	22.2
20	117 12.2	21.2
21	132 12.3	•• 20.2
22	147 12.5	19.2
23	162 12.6	18.3
24	177 12.8	− 5 17.3
code	—	+ 9

STARS No.	SHA ° ′	Dec. ° ′	Transit Mer. Gr. h m
1	358 32.5	+28 49.2	13 12
2	358 22.4	+58 52.9	13 13
3	349 43.1	−18 15.4	13 47
4	339 21.7	+59 59.1	14 29
5	336 01.7	−57 29.2	14 42
6	332 57.4	+89 02.4	14 54
7	328 54.0	+23 14.0	15 10
8	315 53.9	−40 30.1	16 02
9	309 47.9	+49 41.6	16 26
10	291 43.2	+16 24.9	17 39
11	281 57.1	− 8 15.4	18 18
12	281 43.7	+45 57.3	18 18
13	279 22.2	+ 6 18.5	18 28
14	279 11.9	+28 34.3	18 28
15	276 33.9	− 1 13.9	18 39
16	271 52.0	+ 7 24.0	18 58
17	264 16.8	−52 40.2	19 28
18	259 14.9	−16 38.9	19 48
19	255 49.2	−28 54.4	20 02
20	245 48.5	+ 5 21.1	20 42
21	244 24.7	+28 08.9	20 47
22	234 37.0	−59 21.2	21 26
23	223 26.7	−43 14.2	22 11
24	221 49.4	−69 31.0	22 17
25	218 41.9	− 8 26.8	22 30
26	208 33.0	+12 12.3	23 10
27	194 48.0	+62 00.8	0 09
28	183 21.0	+14 50.5	0 55
29	174 01.5	−62 49.7	1 32
30	172 53.0	−56 50.4	1 37
31	168 46.9	−59 25.3	1 53
32	167 00.9	+56 13.2	2 00
33	159 29.9	+55 10.5	2 30
34	159 20.5	−10 54.6	2 31
35	153 35.2	+49 33.0	2 54
36	149 02.8	−36 07.9	3 12
37	146 38.2	+19 25.8	3 21
38	140 55.8	−60 38.2	3 44
39	137 16.6	+74 20.9	3 59
40	126 50.5	+26 52.3	4 40
41	120 38.3	−22 29.2	5 05
42	113 23.8	−26 19.7	5 34
43	109 07.8	−68 56.4	5 51
44	103 06.3	−15 40.2	6 15
45	97 25.6	−37 04.3	6 38
46	96 50.0	+12 35.3	6 40
47	91 08.0	+51 29.2	7 03
48	84 46.1	−34 24.7	7 28
49	81 10.9	+38 43.8	7 42
50	76 56.5	−26 21.7	7 59
51	62 54.2	+ 8 44.0	8 55
52	54 33.3	−56 53.6	9 29
53	50 03.9	+45 06.0	9 46
54	34 33.5	+ 9 38.8	10 48
55	28 42.7	−47 12.0	11 12
56	16 15.9	−29 53.0	12 01
57	14 25.4	+14 56.4	12 09

Lat. °	Sunrise h m	Twlt. begins h m	Moonrise 5 h m	6 h m	7 h m	8 h m
N 70	7 07	3 41	■	8 13	7 33	7 03
68	7 02	3 56	8 40	7 50	7 22	7 00
66	6 57	4 07	8 00	7 31	7 12	6 57
64	6 53	4 15	7 32	7 16	7 05	6 55
62	6 49	4 23	7 11	7 04	6 58	6 53
60	6 46	4 29	6 53	6 53	6 52	6 51
58	6 43	4 35	6 38	6 44	6 47	6 49
56	6 41	4 39	6 25	6 35	6 42	6 48
54	6 39	4 43	6 14	6 28	6 38	6 47
52	6 37	4 46	6 04	6 22	6 34	6 45
50	6 35	4 49	5 55	6 15	6 31	6 44
45	6 31	4 54	5 36	6 02	6 23	6 42
40	6 27	4 59	5 21	5 52	6 17	6 40
35	6 24	5 01	5 08	5 42	6 12	6 38
30	6 21	5 04	4 56	5 34	6 07	6 37
20	6 17	5 04	4 37	5 20	5 58	6 34
10	6 12	5 03	4 19	5 07	5 51	6 32
0	6 08	4 59	4 03	4 56	5 44	6 30
10	6 04	4 54	3 47	4 44	5 37	6 27
20	5 59	4 45	3 29	4 31	5 30	6 25
30	5 54	4 32	3 09	4 17	5 21	6 22
35	5 51	4 23	2 57	4 08	5 16	6 21
40	5 47	4 12	2 43	3 58	5 10	6 19
45	5 43	3 58	2 27	3 47	5 04	6 17
50	5 38	3 40	2 07	3 33	4 56	6 15
52	5 35	3 31	1 57	3 26	4 52	6 14
54	5 33	3 21	1 46	3 19	4 48	6 13
56	5 30	3 08	1 34	3 11	4 43	6 11
58	5 27	2 53	1 20	3 02	4 38	6 10
60 S	5 23	2 36	1 03	2 51	4 33	6 08

Lat. °	Sunset h m	Twlt. ends h m	Moonset 5 h m	6 h m	7 h m	8 h m
N 70	17 17	20 49	■	14 28	16 48	18 53
68	17 23	20 34	12 12	14 49	16 56	18 53
66	17 28	20 22	12 50	15 06	17 03	18 52
64	17 32	20 13	13 17	15 19	17 09	18 52
62	17 35	20 04	13 38	15 30	17 14	18 52
60	17 38	19 58	13 54	15 40	17 19	18 52
58	17 41	19 53	14 08	15 48	17 22	18 52
56	17 43	19 47	14 20	15 55	17 26	18 52
54	17 45	19 43	14 31	16 02	17 29	18 52
52	17 47	19 40	14 40	16 08	17 31	18 52
50	17 49	19 37	14 48	16 13	17 34	18 52
45	17 53	19 31	15 05	16 24	17 39	18 52
40	17 56	19 26	15 19	16 33	17 44	18 51
35	17 59	19 23	15 31	16 41	17 47	18 51
30	18 02	19 21	15 42	16 48	17 51	18 51
20	18 07	19 20	15 59	17 00	17 56	18 51
10	18 11	19 21	16 15	17 10	18 01	18 51
0	18 15	19 24	16 29	17 19	18 06	18 51
10	18 19	19 29	16 43	17 28	18 11	18 50
20	18 23	19 37	16 58	17 38	18 15	18 50
30	18 29	19 50	17 14	17 49	18 21	18 50
35	18 32	19 58	17 24	17 56	18 24	18 50
40	18 35	20 08	17 35	18 03	18 27	18 49
45	18 39	20 22	17 48	18 12	18 31	18 49
50	18 44	20 39	18 04	18 22	18 36	18 49
52	18 46	20 48	18 11	18 26	18 38	18 49
54	18 49	20 58	18 19	18 31	18 41	18 49
56	18 52	21 11	18 28	18 37	18 43	18 48
58	18 55	21 24	18 39	18 43	18 46	18 48
60 S	18 58	21 41	18 50	18 50	18 49	18 48

Equation of Time (App.—Mean)

GCT h	5 m s	6 m s	7 m s
0	−11 50.2	−11 37.0	−11 23.3
6	−11 47.0	−11 33.6	−11 19.8
12	−11 43.7	−11 30.2	−11 16.2
18	−11 40.3	−11 26.7	−11 12.7
24	−11 37.0	−11 23.3	−11 09.1

GCT of Transit Meridian of Greenwich

DAY	Moon h m	Venus h m	Mars h m	Jupiter h m	Saturn h m
5	10 16	13 50	13 21	12 31	1 17
6	11 07	13 51	13 20	12 28	1 13
7	11 55	13 51	13 19	12 25	1 08
8	12 40	13 52	13 18	12 22	1 04

ADDITIONAL ALTITUDE CORRECTIONS

Alt. °	Sun's Low'r Limb ′	Venus ′	Mars ′
0			
30	0.5	0.1	0.1
45	0.5	0.1	0.1
60	0.5	0.1	0.0
75	0.5	0.0	0.0
90	0.5	0.0	0.0

Moon's Lower Limb
Add

Alt. °	5 ′	6 ′	7 ′
0			
4	17.8	17.3	16.6
8	17.8	17.3	16.6
12	17.8	17.3	16.6
16	17.8	17.3	16.5
20	17.8	17.3	16.5
24	17.7	17.2	16.5
28	17.7	17.2	16.5
32	17.6	17.1	16.5
36	17.5	17.1	16.4
40	17.5	17.0	16.4
44	17.4	17.0	16.4
48	17.3	16.9	16.3
52	17.2	16.8	16.3
56	17.1	16.8	16.2
60	17.0	16.7	16.2
64	16.9	16.6	16.1
68	16.8	16.5	16.1
72	16.7	16.4	16.0
76	16.5	16.3	16.0
80	16.4	16.2	15.9
84	16.3	16.1	15.9
88	16.2	16.0	15.8
90	16.1	16.0	15.8

Add to table, back cover

Moon's Upper Limb
Subtract

Alt. °	5 ′	6 ′	7 ′
0			
4	14.2	14.5	15.0
8	14.3	14.5	15.0
12	14.3	14.6	15.0
16	14.3	14.6	15.0
20	14.3	14.6	15.0
24	14.4	14.6	15.0
28	14.4	14.7	15.0
32	14.5	14.7	15.1
36	14.5	14.8	15.1
40	14.6	14.8	15.1
44	14.7	14.9	15.2
48	14.8	15.0	15.2
52	14.9	15.0	15.3
56	15.0	15.1	15.3
60	15.1	15.2	15.3
64	15.2	15.3	15.4
68	15.3	15.4	15.4
72	15.4	15.5	15.5
76	15.5	15.5	15.5
80	15.7	15.6	15.6
84	15.8	15.7	15.7
88	15.9	15.8	15.7
90	16.0	15.9	15.8

Subtract from table, back cover

New Moon 7

GCT	♈	VENUS −3.4		MARS 1.5		JUPITER −1.6		SATURN 0.8		MOON			
	GHA	GHA	Dec.	GHA	Dec.	GHA	Dec.	GHA	Dec.	GHA	code	Dec.	code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
0	164 53.4	152 07.2	+ 4 43.6	160 20.9	+ 1 19.2	174 12.1	− 5 07.7	343 55.3	+ 2 19.5	175 40.4	138	− 4 42.9	+159
1	179 55.9	167 06.9	44.9	175 21.6	19.9	189 14.0	07.4	358 57.9	19.6	190 13.2	138	4 27.0	+160
2	194 58.4	182 06.5	46.2	190 22.3	20.7	204 15.9	07.2	14 00.5	19.7	204 46.0	139	4 11.0	+159
3	210 00.8	197 06.2	47.5	205 23.1	21.5	219 17.8	07.0	29 03.2	19.8	219 18.9	139	3 55.1	+160
4	225 03.3	212 05.8	48.8	220 23.8	22.3	234 19.8	06.7	44 05.8	19.9	233 51.8	139	3 39.1	+160
5	240 05.8	227 05.5	50.1	235 24.5	23.1	249 21.7	06.5	59 08.4	19.9	248 24.7	140	3 23.1	+159
6	255 08.2	242 05.2	+ 4 51.3	250 25.2	+ 1 23.9	264 23.6	− 5 06.3	74 11.1	+ 2 20.0	262 57.7	141	− 3 07.2	+160
7	270 10.7	257 04.8	52.6	265 25.9	24.7	279 25.5	06.0	89 13.7	20.1	277 30.8	140	2 51.2	+159
8	285 13.1	272 04.5	53.9	280 26.6	25.5	294 27.4	05.8	104 16.3	20.2	292 03.8	141	2 35.3	+160
9	300 15.6	287 04.2	55.2	295 27.3	26.2	309 29.3	05.5	119 19.0	20.3	306 36.9	142	2 19.3	+159
10	315 18.1	302 03.8	56.5	310 28.0	27.0	324 31.2	05.3	134 21.6	20.3	321 10.1	142	2 03.4	+160
11	330 20.5	317 03.5	57.8	325 28.7	27.8	339 33.1	05.1	149 24.3	20.4	335 43.3	142	1 47.4	+159
12	345 23.0	332 03.2	+ 4 59.1	340 29.4	+ 1 28.6	354 35.0	− 5 04.8	164 26.9	+ 2 20.5	350 16.5	143	− 1 31.5	+159
13	0 25.5	347 02.8	5 00.3	355 30.1	29.4	9 36.9	04.6	179 29.5	20.6	4 49.8	143	1 15.6	+160
14	15 27.9	2 02.5	01.6	10 30.8	30.2	24 38.8	04.4	194 32.2	20.7	19 23.1	143	0 59.6	+159
15	30 30.4	17 02.1	02.9	25 31.5	31.0	39 40.7	04.1	209 34.8	20.7	33 56.4	144	0 43.7	+159
16	45 32.9	32 01.8	04.2	40 32.3	31.8	54 42.6	03.9	224 37.4	20.8	48 29.8	143	0 27.8	+159
17	60 35.3	47 01.5	05.5	55 33.0	32.5	69 44.5	03.6	239 40.1	20.9	63 03.1	145	− 0 11.9	+158
18	75 37.8	62 01.1	+ 5 06.8	70 33.7	+ 1 33.3	84 46.4	− 5 03.4	254 42.7	+ 2 21.0	77 36.6	144	+ 0 03.9	+159
19	90 40.3	77 00.8	08.1	85 34.4	34.1	99 48.3	03.2	269 45.3	21.1	92 10.0	145	0 19.8	+158
20	105 42.7	92 00.4	09.3	100 35.1	34.9	114 50.2	02.9	284 48.0	21.1	106 43.5	145	0 35.6	+158
21	120 45.2	107 00.1	10.6	115 35.8	35.7	129 52.1	02.7	299 50.6	21.2	121 17.0	145	0 51.4	+158
22	135 47.6	121 59.8	11.9	130 36.5	36.5	144 54.0	02.5	314 53.3	21.3	135 50.5	145	1 07.2	+158
23	150 50.1	136 59.4	13.2	145 37.2	37.3	159 55.9	02.2	329 55.9	21.4	150 24.0	146	1 23.0	+158
0	165 52.6	151 59.1	+ 5 14.5	160 37.9	+ 1 38.0	174 57.8	− 5 02.0	344 58.5	+ 2 21.5	164 57.6	146	+ 1 38.8	+157
1	180 55.0	166 58.8	15.8	175 38.6	38.8	189 59.7	01.8	0 01.2	21.5	179 31.2	146	1 54.5	+157
2	195 57.5	181 58.4	17.0	190 39.3	39.6	205 01.7	01.5	15 03.8	21.6	194 04.8	146	2 10.2	+157
3	211 00.0	196 58.1	18.3	205 40.1	40.4	220 03.6	01.3	30 06.4	21.7	208 38.4	147	2 25.9	+157
4	226 02.4	211 57.7	19.6	220 40.8	41.2	235 05.5	01.0	45 09.1	21.8	223 12.1	146	2 41.6	+156
5	241 04.9	226 57.4	20.9	235 41.5	42.0	250 07.4	00.8	60 11.7	21.9	237 45.7	147	2 57.2	+156
6	256 07.4	241 57.1	+ 5 22.2	250 42.2	+ 1 42.8	265 09.3	− 5 00.6	75 14.4	+ 2 21.9	252 19.4	147	+ 3 12.8	+156
7	271 09.8	256 56.7	23.4	265 42.9	43.6	280 11.2	00.3	90 17.0	22.0	266 53.1	147	3 28.4	+155
8	286 12.3	271 56.4	24.7	280 43.6	44.3	295 13.1	5 00.1	105 19.6	22.1	281 26.8	147	3 43.9	+155
9	301 14.7	286 56.0	26.0	295 44.3	45.1	310 15.0	4 59.9	120 22.3	22.2	296 00.5	147	3 59.4	+155
10	316 17.2	301 55.7	27.3	310 45.0	45.9	325 16.9	59.6	135 24.9	22.3	310 34.2	148	4 14.9	+155
11	331 19.7	316 55.4	28.6	325 45.7	46.7	340 18.8	59.4	150 27.5	22.3	325 08.0	147	4 30.4	+154
12	346 22.1	331 55.0	+ 5 29.8	340 46.4	+ 1 47.5	355 20.7	− 4 59.1	165 30.2	+ 2 22.4	339 41.7	148	+ 4 45.8	+154
13	1 24.6	346 54.7	31.1	355 47.1	48.3	10 22.6	58.9	180 32.8	22.5	354 15.5	147	5 01.2	+153
14	16 27.1	1 54.3	32.4	10 47.8	49.1	25 24.5	58.7	195 35.4	22.6	8 49.2	148	5 16.5	+153
15	31 29.5	16 54.0	33.7	25 48.6	49.8	40 26.4	58.4	210 38.1	22.7	23 23.0	148	5 31.8	+153
16	46 32.0	31 53.7	35.0	40 49.3	50.6	55 28.3	58.2	225 40.7	22.7	37 56.8	147	5 47.1	+152
17	61 34.5	46 53.3	36.2	55 50.0	51.4	70 30.2	58.0	240 43.4	22.8	52 30.5	148	6 02.3	+152
18	76 36.9	61 53.0	+ 5 37.5	70 50.7	+ 1 52.2	85 32.1	− 4 57.7	255 46.0	+ 2 22.9	67 04.3	148	+ 6 17.5	+152
19	91 39.4	76 52.6	38.8	85 51.4	53.0	100 34.0	57.5	270 48.6	23.0	81 38.1	147	6 32.7	+151
20	106 41.9	91 52.3	40.1	100 52.1	53.8	115 35.9	57.2	285 51.3	23.1	96 11.8	148	6 47.8	+150
21	121 44.3	106 52.0	41.4	115 52.8	54.5	130 37.8	57.0	300 53.9	23.1	110 45.6	148	7 02.8	+150
22	136 46.8	121 51.6	42.6	130 53.5	55.3	145 39.7	56.8	315 56.6	23.2	125 19.4	147	7 17.8	+150
23	151 49.2	136 51.3	43.9	145 54.2	56.1	160 41.6	56.5	330 59.2	23.3	139 53.1	148	7 32.8	+149
0	166 51.7	151 50.9	+ 5 45.2	160 54.9	+ 1 56.9	175 43.5	− 4 56.3	346 01.8	+ 2 23.4	154 26.9	148	+ 7 47.7	+149
1	181 54.2	166 50.6	46.5	175 55.6	57.7	190 45.5	56.1	1 04.5	23.5	169 00.7	147	8 02.6	+148
2	196 56.6	181 50.3	47.8	190 56.4	58.5	205 47.4	55.8	16 07.1	23.5	183 34.4	148	8 17.4	+148
3	211 59.1	196 49.9	49.0	205 57.1	1 59.3	220 49.3	55.6	31 09.7	23.6	198 08.2	147	8 32.2	+147
4	227 01.6	211 49.6	50.3	220 57.8	2 00.0	235 51.2	55.4	46 12.4	23.7	212 41.9	147	8 46.9	+147
5	242 04.0	226 49.2	51.6	235 58.5	00.8	250 53.1	55.1	61 15.0	23.8	227 15.6	148	9 01.6	+147
6	257 06.5	241 48.9	+ 5 52.9	250 59.2	+ 2 01.6	265 55.0	− 4 54.9	76 17.7	+ 2 23.9	241 49.4	147	+ 9 16.3	+145
7	272 09.0	256 48.5	54.1	265 59.9	02.4	280 56.9	54.6	91 20.3	23.9	256 23.1	147	9 30.8	+145
8	287 11.4	271 48.2	55.4	281 00.6	03.2	295 58.8	54.4	106 22.9	24.0	270 56.8	147	9 45.3	+145
9	302 13.9	286 47.9	56.7	296 01.3	04.0	311 00.7	54.2	121 25.6	24.1	285 30.5	146	9 59.8	+144
10	317 16.4	301 47.5	58.0	311 02.0	04.7	326 02.6	53.9	136 28.2	24.2	300 04.1	147	10 14.2	+144
11	332 18.8	316 47.2	5 59.2	326 02.7	05.5	341 04.5	53.7	151 30.8	24.3	314 37.8	146	10 28.6	+143
12	347 21.3	331 46.8	+ 6 00.5	341 03.5	+ 2 06.3	356 06.4	− 4 53.5	166 33.5	+ 2 24.3	329 11.4	146	+10 42.9	+142
13	2 23.7	346 46.5	01.8	356 04.2	07.1	11 08.3	53.2	181 36.1	24.4	343 45.0	147	10 57.1	+142
14	17 26.2	1 46.2	03.1	11 04.9	07.9	26 10.2	53.0	196 38.8	24.5	358 18.7	145	11 11.3	+141
15	32 28.7	16 45.8	04.3	26 05.6	08.7	41 12.1	52.7	211 41.4	24.6	12 52.2	146	11 25.4	+140
16	47 31.1	31 45.5	05.6	41 06.3	09.4	56 14.0	52.5	226 44.0	24.7	27 25.8	146	11 39.4	+140
17	62 33.6	46 45.1	06.9	56 07.0	10.2	71 15.9	52.3	241 46.7	24.7	41 59.4	145	11 53.4	+140
18	77 36.1	61 44.8	+ 6 08.2	71 07.7	+ 2 11.0	86 17.8	− 4 52.0	256 49.3	+ 2 24.8	56 32.9	145	+12 07.4	+138
19	92 38.5	76 44.4	09.4	86 08.4	11.8	101 19.7	51.8	271 52.0	24.9	71 06.4	145	12 21.2	+138
20	107 41.0	91 44.1	10.7	101 09.1	12.6	116 21.6	51.6	286 54.6	25.0	85 39.9	145	12 35.0	+138
21	122 43.5	106 43.7	12.0	116 09.8	13.4	131 23.5	51.3	301 57.2	25.1	100 13.4	144	12 48.8	+136
22	137 45.9	121 43.4	13.3	131 10.6	14.2	146 25.4	51.1	316 59.9	25.1	114 46.8	144	13 02.4	+136
23	152 48.4	136 43.1	14.5	146 11.3	14.9	161 27.4	50.8	332 02.5	25.2	129 20.2	144	13 16.0	+136
24	167 50.8	151 42.7	+ 6 15.8	161 12.0	+ 2 15.7	176 29.3	− 4 50.6	347 05.2	+ 2 25.3	143 53.6	144	+13 29.6	+134
code	—	− 3	+ 13	+ 7	+ 8	+ 19	+ 2	+ 26	+ 1				

GCT	SUN GHA	SUN Dec.
h	° ′	° ′
0	177 12.8	− 5 17.3
1	192 12.9	16.3
2	207 13.1	15.3
3	222 13.2	•• 14.4
4	237 13.4	13.4
5	252 13.5	12.4
6	267 13.7	− 5 11.5
7	282 13.8	10.5
8	297 14.0	09.5
9	312 14.1	•• 08.5
10	327 14.3	07.6
11	342 14.4	06.6
12	357 14.6	− 5 05.6
13	12 14.7	04.6
14	27 14.9	03.7
15	42 15.1	•• 02.7
16	57 15.2	01.7
17	72 15.4	5 00.7
18	87 15.5	− 4 59.8
19	102 15.7	58.8
20	117 15.8	57.8
21	132 16.0	•• 56.8
22	147 16.1	55.9
23	162 16.3	54.9
0	177 16.4	− 4 53.9
1	192 16.6	52.9
2	207 16.7	52.0
3	222 16.9	•• 51.0
4	237 17.0	50.0
5	252 17.2	49.0
6	267 17.3	− 4 48.1
7	282 17.5	47.1
8	297 17.7	46.1
9	312 17.8	•• 45.1
10	327 18.0	44.2
11	342 18.1	43.2
12	357 18.3	− 4 42.2
13	12 18.4	41.2
14	27 18.6	40.2
15	42 18.7	•• 39.3
16	57 18.9	38.3
17	72 19.1	37.3
18	87 19.2	− 4 36.3
19	102 19.4	35.4
20	117 19.5	34.4
21	132 19.7	•• 33.4
22	147 19.8	32.4
23	162 20.0	31.4
0	177 20.1	− 4 30.5
1	192 20.3	29.5
2	207 20.5	28.5
3	222 20.6	•• 27.5
4	237 20.8	26.6
5	252 20.9	25.6
6	267 21.1	− 4 24.6
7	282 21.3	23.6
8	297 21.4	22.6
9	312 21.6	•• 21.7
10	327 21.7	20.7
11	342 21.9	19.7
12	357 22.0	− 4 18.7
13	12 22.2	17.7
14	27 22.4	16.8
15	42 22.5	•• 15.8
16	57 22.7	14.8
17	72 22.8	13.8
18	87 23.0	− 4 12.9
19	102 23.2	11.9
20	117 23.3	10.9
21	132 23.5	•• 09.9
22	147 23.6	08.9
23	162 23.8	08.0
24	177 24.0	− 4 07.0
code	—	+ 10

STARS No.	SHA	Dec.	Transit Mer. Gr.
	° ′	° ′	h m
1	358 32.5	+28 49.2	13 00
2	358 22.4	+58 52.9	13 01
3	349 43.1	−18 15.4	13 35
4	339 21.7	+59 59.1	14 17
5	336 01.7	−57 29.2	14 30
6	332 58.1	+89 02.4	14 42
7	328 54.0	+23 14.0	14 58
8	315 53.9	−40 30.1	15 50
9	309 47.9	+49 41.6	16 15
10	291 43.3	+16 24.9	17 27
11	281 57.1	− 8 15.4	18 06
12	281 43.8	+45 57.3	18 07
13	279 22.3	+ 6 18.5	18 16
14	279 11.9	+28 34.3	18 17
15	276 33.9	− 1 13.9	18 27
16	271 52.0	+ 7 24.0	18 46
17	264 16.8	−52 40.3	19 16
18	259 14.9	−16 38.9	19 36
19	255 49.2	−28 54.4	19 50
20	245 48.6	+ 5 21.1	20 30
21	244 24.7	+28 08.9	20 35
22	234 37.0	−59 21.2	21 15
23	223 26.7	−43 14.2	21 59
24	221 49.4	−69 31.1	22 06
25	218 41.9	− 8 26.8	22 18
26	208 33.0	+12 12.3	22 59
27	194 48.0	+62 00.9	23 53
28	183 21.0	+14 50.5	0 43
29	174 01.5	−62 49.7	1 20
30	172 53.0	−56 50.4	1 25
31	168 46.8	−59 25.3	1 41
32	167 00.9	+56 13.2	1 48
33	159 29.8	+55 10.5	2 18
34	159 20.4	−10 54.6	2 19
35	153 35.1	+49 33.1	2 42
36	149 02.7	−36 07.9	3 00
37	146 38.2	+19 25.8	3 09
38	140 55.7	−60 38.2	3 32
39	137 16.6	+74 20.9	3 47
40	126 50.5	+26 52.3	4 28
41	120 38.2	−22 29.2	4 53
42	113 23.7	−26 19.7	5 22
43	109 07.8	−68 56.4	5 39
44	103 06.3	−15 40.2	6 03
45	97 25.6	−37 04.3	6 26
46	96 50.0	+12 35.3	6 28
47	91 08.0	+51 29.2	6 51
48	84 46.1	−34 24.7	7 16
49	81 10.9	+38 43.8	7 31
50	76 56.5	−26 21.7	7 47
51	62 54.1	+ 8 44.0	8 43
52	54 33.2	−56 53.6	9 17
53	50 03.9	+45 06.0	9 35
54	34 33.4	+ 9 38.8	10 37
55	28 42.7	−47 12.0	11 00
56	16 15.8	−29 53.0	11 49
57	14 25.4	+14 56.4	11 57

Lat.	Sunrise	Twlt. begins	Moonrise 8	Moonrise 9	Moonrise 10	Moonrise 11
°	h m	h m	h m	h m	h m	h m
N 70	6 54	3 24	7 03	6 36	6 08	5 31
68	6 49	3 40	7 00	6 39	6 18	5 53
66	6 45	3 54	6 57	6 43	6 28	6 10
64	6 42	4 04	6 55	6 45	6 35	6 25
62	6 40	4 13	6 53	6 47	6 42	6 37
60	6 37	4 20	6 51	6 49	6 48	6 47
58	6 35	4 26	6 49	6 51	6 53	6 56
56	6 33	4 31	6 48	6 53	6 58	7 04
54	6 31	4 36	6 47	6 54	7 02	7 11
52	6 30	4 39	6 45	6 55	7 06	7 17
50	6 28	4 42	6 44	6 57	7 09	7 23
45	6 25	4 49	6 42	6 59	7 17	7 36
40	6 22	4 54	6 40	7 01	7 23	7 46
35	6 20	4 57	6 38	7 03	7 29	7 55
30	6 18	5 00	6 37	7 05	7 33	8 03
20	6 14	5 02	6 34	7 08	7 42	8 17
10	6 11	5 01	6 32	7 11	7 50	8 29
0	6 07	4 59	6 30	7 13	7 57	8 40
10	6 04	4 54	6 27	7 16	8 04	8 52
20	6 00	4 46	6 25	7 19	8 12	9 04
30	5 56	4 34	6 22	7 22	8 20	9 19
35	5 53	4 27	6 21	7 24	8 26	9 27
40	5 50	4 16	6 19	7 26	8 31	9 36
45	5 47	4 04	6 17	7 28	8 38	9 48
50	5 43	3 47	6 15	7 31	8 47	10 01
52	5 41	3 39	6 14	7 33	8 50	10 08
54	5 39	3 29	6 13	7 34	8 55	10 15
56	5 37	3 18	6 11	7 36	8 59	10 23
58	5 34	3 05	6 10	7 38	9 05	10 32
S 60	5 31	2 49	6 08	7 40	9 11	10 42

Lat.	Sunset	Twlt. ends	Moonset 8	Moonset 9	Moonset 10	Moonset 11
°	h m	h m	h m	h m	h m	h m
N 70	17 30	21 05	18 53	20 54	23 03	25 47
68	17 34	20 47	18 53	20 46	22 43	24 55
66	17 38	20 34	18 52	20 39	22 27	24 23
64	17 41	20 23	18 52	20 33	22 14	24 00
62	17 43	20 13	18 52	20 28	22 03	23 42
60	17 46	20 07	18 52	20 23	21 54	23 27
58	17 48	20 00	18 52	20 19	21 46	23 14
56	17 50	19 55	18 52	20 16	21 39	23 03
54	17 51	19 49	18 52	20 13	21 33	22 53
52	17 53	19 46	18 52	20 10	21 27	22 45
50	17 54	19 42	18 52	20 08	21 22	22 37
45	17 57	19 35	18 52	20 02	21 12	22 21
40	18 00	19 30	18 51	19 57	21 03	22 08
35	18 02	19 26	18 51	19 54	20 55	21 56
30	18 04	19 23	18 51	19 50	20 48	21 47
20	18 08	19 21	18 51	19 44	20 37	21 30
10	18 11	19 21	18 51	19 39	20 27	21 15
0	18 14	19 23	18 51	19 34	20 17	21 02
10	18 17	19 27	18 50	19 29	20 08	20 48
20	18 21	19 35	18 50	19 24	19 58	20 34
30	18 25	19 46	18 50	19 18	19 47	20 18
35	18 27	19 53	18 50	19 15	19 41	20 08
40	18 30	20 03	18 49	19 11	19 33	19 57
45	18 34	20 16	18 49	19 07	19 25	19 45
50	18 38	20 32	18 49	19 01	19 14	19 30
52	18 39	20 39	18 49	18 59	19 10	19 22
54	18 41	20 48	18 49	18 56	19 05	19 15
56	18 44	21 00	18 48	18 53	18 59	19 06
58	18 46	21 12	18 48	18 50	18 53	18 56
S 60	18 49	21 27	18 48	18 47	18 45	18 45

GCT	Equation of Time (App.—Mean) 8	9	10
h	m s	m s	m s
0	−11 09.1	−10 54.6	−10 39.7
6	−11 05.5	−10 50.9	−10 35.9
12	−11 01.9	−10 47.2	−10 32.1
18	−10 58.3	−10 43.5	−10 28.3
24	−10 54.6	−10 39.7	−10 24.5

GCT of Transit Meridian of Greenwich

DAY	Moon	Venus	Mars	Jupiter	Saturn
	h m	h m	h m	h m	h m
8	12 40	13 52	13 18	12 22	1 04
9	13 24	13 52	13 17	12 19	1 00
10	14 07	13 53	13 16	12 16	0 56
11	14 51	13 54	13 15	12 13	0 52

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb	Venus	Mars
°	′	′	′
0			
	0.4	0.1	0.1
30			
	0.4	0.1	0.1
45			
	0.4	0.1	0.0
60			
	0.4	0.0	0.0
75			
	0.4	0.0	0.0
90			

Moon's Lower Limb
Add

Alt.	8	9	10
°	′	′	′
0			
	15.8	15.0	14.2
4			
	15.8	15.0	14.2
8			
	15.8	15.0	14.2
12			
	15.8	15.1	14.2
16			
	15.8	15.1	14.2
20			
	15.8	15.1	14.2
24			
	15.8	15.1	14.3
28			
	15.8	15.1	14.3
32			
	15.8	15.1	14.3
36			
	15.8	15.1	14.4
40			
	15.8	15.1	14.4
44			
	15.7	15.2	14.5
48			
	15.7	15.2	14.5
52			
	15.7	15.2	14.6
56			
	15.7	15.2	14.7
60			
	15.7	15.3	14.7
64			
	15.7	15.3	14.8
68			
	15.7	15.3	14.9
72			
	15.7	15.3	14.9
76			
	15.6	15.4	15.0
80			
	15.6	15.4	15.1
84			
	15.6	15.4	15.2
88			
	15.6	15.4	15.2
90			

Add to table, back cover

Moon's Upper Limb
Subtract

Alt.	8	9	10
°	′	′	′
0			
	15.4	15.8	16.4
4			
	15.4	15.8	16.3
8			
	15.4	15.8	16.3
12			
	15.4	15.8	16.3
16			
	15.4	15.8	16.3
20			
	15.4	15.8	16.3
24			
	15.4	15.8	16.2
28			
	15.4	15.8	16.2
32			
	15.4	15.8	16.2
36			
	15.4	15.8	16.1
40			
	15.5	15.7	16.1
44			
	15.5	15.7	16.0
48			
	15.5	15.7	16.0
52			
	15.5	15.7	15.9
56			
	15.5	15.7	15.8
60			
	15.5	15.6	15.8
64			
	15.5	15.6	15.7
68			
	15.5	15.6	15.6
72			
	15.6	15.6	15.6
76			
	15.6	15.5	15.5
80			
	15.6	15.5	15.4
84			
	15.6	15.5	15.3
88			
	15.6	15.4	15.3
90			

Subtract from table, back cover

833190°—50——4

GCT	♈ GHA	VENUS −3.4 GHA	VENUS Dec.	MARS 1.5 GHA	MARS Dec.	JUPITER −1.6 GHA	JUPITER Dec.	SATURN 0.8 GHA	SATURN Dec.	MOON GHA	code	Dec.	code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
0	167 50.8	151 42.7	+ 6 15.8	161 12.0	+ 2 15.7	176 29.3	− 4 50.6	347 05.2	+ 2 25.3	143 53.6	144	+13 29.6	+134
1	182 53.3	166 42.4	17.1	176 12.7	16.5	191 31.2	50.4	2 07.8	25.4	158 27.0	143	13 43.0	+134
2	197 55.8	181 42.0	18.3	191 13.4	17.3	206 33.1	50.1	17 10.4	25.5	173 00.3	143	13 56.4	+134
3	212 58.2	196 41.7	·· 19.6	206 14.1	·· 18.1	221 35.0	·· 49.9	32 13.1	·· 25.5	187 33.6	143	·14 09.8	+132
4	228 00.7	211 41.3	20.9	221 14.8	18.9	236 36.9	49.7	47 15.7	25.6	202 06.9	142	14 23.0	+132
5	243 03.2	226 41.0	22.2	236 15.5	19.6	251 38.8	49.4	62 18.3	25.7	216 40.1	142	14 36.2	+131
6	258 05.6	241 40.7	+ 6 23.4	251 16.2	+ 2 20.4	266 40.7	− 4 49.2	77 21.0	+ 2 25.8	231 13.3	142	+14 49.3	+130
7	273 08.1	256 40.3	24.7	266 16.9	21.2	281 42.6	48.9	92 23.6	25.9	245 46.5	142	15 02.3	+130
8	288 10.6	271 40.0	26.0	281 17.7	22.0	296 44.5	48.7	107 26.3	25.9	260 19.7	141	15 15.3	+129
9	303 13.0	286 39.6	·· 27.2	296 18.4	·· 22.8	311 46.4	·· 48.5	122 28.9	·· 26.0	274 52.8	141	·15 28.2	+128
10	318 15.5	301 39.3	28.5	311 19.1	23.5	326 48.3	48.2	137 31.5	26.1	289 25.9	140	15 41.0	+127
11	333 18.0	316 38.9	29.8	326 19.8	24.3	341 50.2	48.0	152 34.2	26.2	303 58.9	140	15 53.7	+127
12	348 20.4	331 38.6	+ 6 31.1	341 20.5	+ 2 25.1	356 52.1	− 4 47.8	167 36.8	+ 2 26.3	318 31.9	140	+16 06.4	+125
13	3 22.9	346 38.2	32.3	356 21.2	25.9	11 54.0	47.5	182 39.5	26.4	333 04.9	140	16 18.9	+125
14	18 25.3	1 37.9	33.6	11 21.9	26.7	26 55.9	47.3	197 42.1	26.4	347 37.9	139	16 31.4	+125
15	33 27.8	16 37.5	·· 34.9	26 22.6	·· 27.5	41 57.8	·· 47.0	212 44.7	·· 26.5	2 10.8	139	·16 43.9	+123
16	48 30.3	31 37.2	36.1	41 23.3	28.2	56 59.7	46.8	227 47.4	26.6	16 43.7	138	16 56.2	+122
17	63 32.7	46 36.8	37.4	56 24.1	29.0	72 01.6	46.6	242 50.0	26.7	31 16.5	138	17 08.4	+122
18	78 35.2	61 36.5	+ 6 38.7	71 24.8	+ 2 29.8	87 03.5	− 4 46.3	257 52.7	+ 2 26.8	45 49.3	137	+17 20.6	+121
19	93 37.7	76 36.2	39.9	86 25.5	30.6	102 05.4	46.1	272 55.3	26.8	60 22.0	138	17 32.7	+120
20	108 40.1	91 35.8	41.2	101 26.2	31.4	117 07.3	45.9	287 57.9	26.9	74 54.8	136	17 44.7	+119
21	123 42.6	106 35.5	·· 42.5	116 26.9	·· 32.1	132 09.3	·· 45.6	303 00.6	·· 27.0	89 27.4	137	·17 56.6	+118
22	138 45.1	121 35.1	43.7	131 27.6	32.9	147 11.2	45.4	318 03.2	27.1	104 00.1	136	18 08.4	+118
23	153 47.5	136 34.8	45.0	146 28.3	33.7	162 13.1	45.1	333 05.9	27.2	118 32.7	135	18 20.2	+116
0	168 50.0	151 34.4	+ 6 46.3	161 29.0	+ 2 34.5	177 15.0	− 4 44.9	348 08.5	+ 2 27.2	133 05.2	135	+18 31.8	+116
1	183 52.4	166 34.1	47.5	176 29.7	35.3	192 16.9	44.7	3 11.1	27.3	147 37.7	135	18 43.4	+115
2	198 54.9	181 33.7	48.8	191 30.4	36.1	207 18.8	44.4	18 13.8	27.4	162 10.2	134	18 54.9	+113
3	213 57.4	196 33.4	·· 50.1	206 31.2	·· 36.8	222 20.7	·· 44.2	33 16.4	·· 27.5	176 42.6	134	·19 06.2	+113
4	228 59.8	211 33.0	51.3	221 31.9	37.6	237 22.6	44.0	48 19.1	27.6	191 15.0	133	19 17.5	+112
5	244 02.3	226 32.7	52.6	236 32.6	38.4	252 24.5	43.7	63 21.7	27.6	205 47.3	133	19 28.7	+112
6	259 04.8	241 32.3	+ 6 53.9	251 33.3	+ 2 39.2	267 26.4	− 4 43.5	78 24.3	+ 2 27.7	220 19.6	133	+19 39.9	+110
7	274 07.2	256 32.0	55.1	266 34.0	40.0	282 28.3	43.2	93 27.0	27.8	234 51.9	132	19 50.9	+109
8	289 09.7	271 31.6	56.4	281 34.7	40.7	297 30.2	43.0	108 29.6	27.9	249 24.1	131	20 01.8	+108
9	304 12.2	286 31.3	·· 57.7	296 35.4	·· 41.5	312 32.1	·· 42.8	123 32.3	·· 28.0	263 56.2	131	·20 12.6	+108
10	319 14.6	301 30.9	6 58.9	311 36.1	42.3	327 34.0	42.5	138 34.9	28.0	278 28.3	131	20 23.4	+106
11	334 17.1	316 30.6	7 00.2	326 36.8	43.1	342 35.9	42.3	153 37.5	28.1	293 00.4	130	20 34.0	+106
12	349 19.6	331 30.2	+ 7 01.4	341 37.6	+ 2 43.9	357 37.8	− 4 42.1	168 40.2	+ 2 28.2	307 32.4	129	+20 44.6	+104
13	4 22.0	346 29.9	02.7	356 38.3	44.6	12 39.7	41.8	183 42.8	28.3	322 04.3	130	20 55.0	+103
14	19 24.5	1 29.5	04.0	11 39.0	45.4	27 41.6	41.6	198 45.5	28.4	336 36.3	128	21 05.3	+103
15	34 26.9	16 29.2	·· 05.2	26 39.7	·· 46.2	42 43.5	·· 41.4	213 48.1	·· 28.4	351 08.1	128	·21 15.6	+101
16	49 29.4	31 28.8	06.5	41 40.4	47.0	57 45.4	41.1	228 50.7	28.5	5 39.9	128	21 25.7	+101
17	64 31.9	46 28.5	07.8	56 41.1	47.8	72 47.3	40.9	243 53.4	28.6	20 11.7	127	21 35.8	+ 99
18	79 34.3	61 28.1	+ 7 09.0	71 41.8	+ 2 48.5	87 49.2	− 4 40.6	258 56.0	+ 2 28.7	34 43.4	127	+21 45.7	+ 99
19	94 36.8	76 27.8	10.3	86 42.5	49.3	102 51.2	40.4	273 58.7	28.8	49 15.1	126	21 55.6	+ 97
20	109 39.3	91 27.4	11.5	101 43.2	50.1	117 53.1	40.2	289 01.3	28.8	63 46.7	126	22 05.3	+ 97
21	124 41.7	106 27.1	·· 12.8	116 44.0	·· 50.9	132 55.0	·· 39.9	304 03.9	·· 28.9	78 18.3	125	·22 15.0	+ 95
22	139 44.2	121 26.7	14.1	131 44.7	51.7	147 56.9	39.7	319 06.6	29.0	92 49.8	125	22 24.5	+ 94
23	154 46.7	136 26.4	15.3	146 45.4	52.4	162 58.8	39.5	334 09.2	29.1	107 21.3	124	22 33.9	+ 94
0	169 49.1	151 26.0	+ 7 16.6	161 46.1	+ 2 53.2	178 00.7	− 4 39.2	349 11.9	+ 2 29.2	121 52.7	124	+22 43.3	+ 92
1	184 51.6	166 25.7	17.8	176 46.8	54.0	193 02.6	39.0	4 14.5	29.3	136 24.1	123	22 52.5	+ 91
2	199 54.1	181 25.3	19.1	191 47.5	54.8	208 04.5	38.7	19 17.1	29.3	150 55.4	123	23 01.6	+ 90
3	214 56.5	196 25.0	·· 20.4	206 48.2	·· 55.6	223 06.4	·· 38.5	34 19.8	·· 29.4	165 26.7	122	·23 10.6	+ 89
4	229 59.0	211 24.6	21.6	221 48.9	56.3	238 08.3	38.3	49 22.4	29.5	179 57.9	122	23 19.5	+ 88
5	245 01.4	226 24.3	22.9	236 49.7	57.1	253 10.2	38.0	64 25.1	29.6	194 29.1	121	23 28.3	+ 87
6	260 03.9	241 23.9	+ 7 24.1	251 50.4	+ 2 57.9	268 12.1	− 4 37.8	79 27.7	+ 2 29.7	209 00.2	121	+23 37.0	+ 85
7	275 06.4	256 23.6	25.4	266 51.1	58.7	283 14.0	37.6	94 30.4	29.7	223 31.3	120	23 45.5	+ 85
8	290 08.8	271 23.2	26.7	281 51.8	2 59.5	298 15.9	37.3	109 33.0	29.8	238 02.3	120	23 54.0	+ 84
9	305 11.3	286 22.9	·· 27.9	296 52.5	· 3 00.2	313 17.8	·· 37.1	124 35.6	·· 29.9	252 33.3	119	·24 02.4	+ 82
10	320 13.8	301 22.5	29.2	311 53.2	01.0	328 19.7	36.8	139 38.3	30.0	267 04.2	118	24 10.6	+ 81
11	335 16.2	316 22.2	30.4	326 53.9	01.8	343 21.6	36.6	154 40.9	30.1	281 35.0	119	24 18.7	+ 80
12	350 18.7	331 21.8	+ 7 31.7	341 54.6	+ 3 02.6	358 23.5	− 4 36.4	169 43.6	+ 2 30.1	296 05.9	117	+24 26.7	+ 79
13	5 21.2	346 21.5	32.9	356 55.3	03.4	13 25.4	36.1	184 46.2	30.2	310 36.6	117	24 34.6	+ 78
14	20 23.6	1 21.1	34.2	11 56.1	04.1	28 27.3	35.9	199 48.8	30.3	325 07.3	117	24 42.4	+ 77
15	35 26.1	16 20.8	·· 35.5	26 56.8	·· 04.9	43 29.3	·· 35.7	214 51.5	·· 30.4	339 38.0	116	·24 50.1	+ 75
16	50 28.5	31 20.4	36.7	41 57.5	05.7	58 31.2	35.4	229 54.1	30.5	354 08.6	116	24 57.6	+ 74
17	65 31.0	46 20.0	38.0	56 58.2	06.5	73 33.1	35.2	244 56.8	30.5	8 39.2	115	25 05.0	+ 74
18	80 33.5	61 19.7	+ 7 39.2	71 58.9	+ 3 07.2	88 35.0	− 4 34.9	259 59.4	+ 2 30.6	23 09.7	115	+25 12.4	+ 72
19	95 35.9	76 19.3	40.5	86 59.6	08.0	103 36.9	34.7	275 02.1	30.7	37 40.2	114	25 19.6	+ 70
20	110 38.4	91 19.0	41.7	102 00.3	08.8	118 38.8	34.5	290 04.7	30.8	52 10.6	114	25 26.6	+ 70
21	125 40.9	106 18.6	·· 43.0	117 01.0	·· 09.6	133 40.7	·· 34.2	305 07.3	·· 30.9	66 41.0	113	·25 33.6	+ 68
22	140 43.3	121 18.3	44.2	132 01.7	10.4	148 42.6	34.0	320 10.0	30.9	81 11.3	113	25 40.4	+ 68
23	155 45.8	136 17.9	45.5	147 02.5	11.1	163 44.5	33.8	335 12.6	31.0	95 41.6	112	25 47.2	+ 66
24	170 48.3	151 17.6	+ 7 46.7	162 03.2	+ 3 11.9	178 46.4	− 4 33.5	350 15.3	+ 2 31.1	110 11.8	112	+25 53.8	+ 64
code	—	− 3	+ 13	+ 7	+ 7	+ 19	+ 3	+ 26	+ 1				

SUN

GCT h	GHA ° ′	Dec. ° ′
11 (Sun.)		
0	177 24.0	− 4 07.0
1	192 24.1	06.0
2	207 24.3	05.0
3	222 24.4	·· 04.0
4	237 24.6	03.0
5	252 24.8	02.1
6	267 24.9	− 4 01.1
7	282 25.1	4 00.1
8	297 25.3	3 59.1
9	312 25.4	·· 58.1
10	327 25.6	57.2
11	342 25.7	56.2
12	357 25.9	− 3 55.2
13	12 26.1	54.2
14	27 26.2	53.2
15	42 26.4	·· 52.3
16	57 26.6	51.3
17	72 26.7	50.3
18	87 26.9	− 3 49.3
19	102 27.0	48.3
20	117 27.2	47.4
21	132 27.4	·· 46.4
22	147 27.5	45.4
23	162 27.7	44.4
12 (Mon.)		
0	177 27.9	− 3 43.4
1	192 28.0	42.4
2	207 28.2	41.5
3	222 28.4	·· 40.5
4	237 28.5	39.5
5	252 28.7	38.5
6	267 28.9	− 3 37.5
7	282 29.0	36.5
8	297 29.2	35.6
9	312 29.4	·· 34.6
10	327 29.5	33.6
11	342 29.7	32.6
12	357 29.9	− 3 31.6
13	12 30.0	30.7
14	27 30.2	29.7
15	42 30.4	·· 28.7
16	57 30.5	27.7
17	72 30.7	26.7
18	87 30.9	− 3 25.7
19	102 31.0	24.8
20	117 31.2	23.8
21	132 31.4	·· 22.8
22	147 31.5	21.8
23	162 31.7	20.8
13 (Tue.)		
0	177 31.9	− 3 19.8
1	192 32.0	18.8
2	207 32.2	17.9
3	222 32.4	·· 16.9
4	237 32.5	15.9
5	252 32.7	14.9
6	267 32.9	− 3 13.9
7	282 33.0	12.9
8	297 33.2	12.0
9	312 33.4	·· 11.0
10	327 33.5	10.0
11	342 33.7	09.0
12	357 33.9	− 3 08.0
13	12 34.0	07.0
14	27 34.2	06.1
15	42 34.4	·· 05.1
16	57 34.6	04.1
17	72 34.7	03.1
18	87 34.9	− 3 02.1
19	102 35.1	01.1
20	117 35.2	3 00.1
21	132 35.4	· 2 59.2
22	147 35.6	58.2
23	162 35.7	57.2
24	177 35.9	− 2 56.2
code	—	+ 9

STARS

No.	SHA ° ′	Dec. ° ′	Transit Mer. Gr. h m
1	358 32.5	+28 49.2	12 48
2	358 22.4	+58 52.9	12 49
3	349 43.1	−18 15.4	13 24
4	339 21.7	+59 59.1	14 05
5	336 01.7	−57 29.2	14 18
6	332 58.6	+89 02.4	14 30
7	328 54.0	+23 14.0	14 47
8	315 54.0	−40 30.1	15 39
9	309 47.9	+49 41.6	16 03
10	291 43.3	+16 24.9	17 15
11	281 57.1	− 8 15.4	17 54
12	281 43.8	+45 57.3	17 55
13	279 22.3	+ 6 18.5	18 04
14	279 11.9	+28 34.3	18 05
15	276 33.9	− 1 13.9	18 15
16	271 52.0	+ 7 24.0	18 34
17	264 16.8	−52 40.3	19 04
18	259 14.9	−16 38.9	19 24
19	255 49.2	−28 54.4	19 38
20	245 48.6	+ 5 21.1	20 18
21	244 24.7	+28 08.9	20 24
22	234 37.0	−59 21.3	21 03
23	223 26.7	−43 14.2	21 47
24	221 49.4	−69 31.1	21 54
25	218 41.9	− 8 26.8	22 06
26	208 33.0	+12 12.3	22 47
27	194 48.0	+62 00.9	23 42
28	183 21.0	+14 50.5	0 31
29	174 01.5	−62 49.8	1 08
30	172 53.0	−56 50.4	1 13
31	168 46.8	−59 25.4	1 29
32	167 00.9	+56 13.2	1 36
33	159 29.8	+55 10.5	2 06
34	159 20.4	−10 54.6	2 07
35	153 35.1	+49 33.1	2 30
36	149 02.7	−36 07.9	2 48
37	146 38.2	+19 25.8	2 58
38	140 55.7	−60 38.2	3 20
39	137 16.5	+74 20.9	3 35
40	126 50.5	+26 52.3	4 17
41	120 38.2	−22 29.2	4 41
42	113 23.7	−26 19.7	5 10
43	109 07.7	−68 56.4	5 27
44	103 06.3	−15 40.2	5 51
45	97 25.6	−37 04.3	6 14
46	96 50.0	+12 35.3	6 16
47	91 08.0	+51 29.2	6 39
48	84 46.0	−34 24.7	7 04
49	81 10.8	+38 43.8	7 19
50	76 56.5	−26 21.7	7 36
51	62 54.1	+ 8 44.0	8 32
52	54 33.2	−56 53.6	9 05
53	50 03.9	+45 06.0	9 23
54	34 33.4	+ 9 38.8	10 25
55	28 42.7	−47 12.0	10 48
56	16 15.8	−29 53.0	11 38
57	14 25.4	+14 56.4	11 45

Lat. °	Sunrise h m	Twlt. begins h m	Moonrise 11 h m	Moonrise 12 h m	Moonrise 13 h m	Moonrise 14 h m
N 70	6 40	3 05	5 31	4 21	▭	▭
68	6 37	3 25	5 53	5 14	▭	▭
66	6 34	3 40	6 10	5 47	4 58	▭
64	6 32	3 52	6 25	6 12	5 52	▭
62	6 30	4 02	6 37	6 31	6 24	6 15
60	6 28	4 10	6 47	6 47	6 48	6 54
58	6 27	4 16	6 56	7 00	7 08	7 22
56	6 25	4 23	7 04	7 12	7 24	7 43
54	6 24	4 28	7 11	7 22	7 38	8 01
52	6 23	4 32	7 17	7 32	7 50	8 16
50	6 22	4 36	7 23	7 40	8 01	8 29
45	6 20	4 43	7 36	7 57	8 24	8 57
40	6 18	4 49	7 46	8 12	8 42	9 18
35	6 16	4 53	7 55	8 24	8 57	9 36
30	6 14	4 57	8 03	8 35	9 11	9 51
20	6 12	5 00	8 17	8 54	9 34	10 18
10	6 09	5 00	8 29	9 10	9 54	10 41
0	6 07	4 58	8 40	9 25	10 13	11 02
10	6 04	4 54	8 52	9 41	10 31	11 23
20	6 01	4 47	9 04	9 58	10 52	11 46
30	5 58	4 36	9 19	10 17	11 15	12 13
35	5 56	4 29	9 27	10 28	11 29	12 29
40	5 54	4 21	9 36	10 41	11 45	12 47
45	5 51	4 09	9 48	10 57	12 05	13 10
50	5 48	3 53	10 01	11 16	12 29	13 39
52	5 46	3 45	10 08	11 25	12 41	13 53
54	5 44	3 37	10 15	11 35	12 54	14 09
56	5 43	3 27	10 23	11 47	13 10	14 29
58	5 41	3 14	10 32	12 00	13 29	14 53
S 60	5 38	3 01	10 42	12 16	13 52	15 26

Lat. °	Sunset h m	Twlt. ends h m	Moonset 11 h m	Moonset 12 h m	Moonset 13 h m	Moonset 14 h m
N 70	17 42	21 22	25 47	1 47	▭	▭
68	17 45	21 02	24 55	0 55	▭	▭
66	17 48	20 46	24 23	0 23	2 50	▭
64	17 50	20 34	24 00	0 00	1 57	▭
62	17 52	20 24	23 42	25 25	1 25	3 15
60	17 53	20 15	23 27	25 01	1 01	2 36
58	17 55	20 08	23 14	24 42	0 42	2 09
56	17 56	20 01	23 03	24 27	0 27	1 48
54	17 57	19 56	22 53	24 13	0 13	1 30
52	17 58	19 51	22 45	24 01	0 01	1 16
50	17 59	19 47	22 37	23 51	25 03	1 03
45	18 01	19 39	22 21	23 30	24 36	0 36
40	18 03	19 33	22 08	23 12	24 15	0 15
35	18 05	19 29	21 56	22 58	23 58	24 56
30	18 06	19 26	21 47	22 45	23 43	24 40
20	18 09	19 22	21 30	22 24	23 18	24 12
10	18 11	19 21	21 15	22 05	22 56	23 48
0	18 13	19 22	21 02	21 48	22 36	23 26
10	18 16	19 26	20 48	21 31	22 16	23 04
20	18 18	19 32	20 34	21 12	21 54	22 40
30	18 22	19 42	20 18	20 52	21 29	22 13
35	18 23	19 49	20 08	20 39	21 15	21 56
40	18 26	19 58	19 57	20 25	20 58	21 37
45	18 28	20 09	19 45	20 09	20 38	21 14
50	18 31	20 24	19 30	19 48	20 13	20 45
52	18 33	20 31	19 22	19 39	20 00	20 31
54	18 34	20 39	19 15	19 28	19 47	20 14
56	18 36	20 49	19 06	19 16	19 30	19 54
58	18 38	21 01	18 56	19 02	19 11	19 30
S 60	18 40	21 14	18 45	18 45	18 48	18 56

ADDITIONAL ALTITUDE CORRECTIONS

Alt. °	Sun's Low'r Limb ′	Venus ′	Mars ′
0			
	0.4	0.1	0.1
30			
	0.4	0.1	0.0
45			
	0.4	0.1	0.0
60			
	0.4	0.0	0.0
75			
	0.4	0.0	0.0
90			

Moon's Lower Limb
Add

Alt. °	11 ′	12 ′	13 ′
0			
	13.5	12.9	12.4
4			
	13.5	12.9	12.4
8			
	13.5	12.9	12.4
12			
	13.6	12.9	12.4
16			
	13.6	13.0	12.5
20			
	13.6	13.0	12.6
24			
	13.7	13.1	12.6
28			
	13.7	13.2	12.7
32			
	13.8	13.2	12.8
36			
	13.9	13.3	12.9
40			
	13.9	13.4	13.0
44			
	14.0	13.5	13.1
48			
	14.1	13.6	13.3
52			
	14.2	13.7	13.4
56			
	14.3	13.9	13.5
60			
	14.4	14.0	13.7
64			
	14.5	14.1	13.9
68			
	14.6	14.3	14.0
72			
	14.7	14.4	14.2
76			
	14.8	14.5	14.4
80			
	14.9	14.7	14.5
84			
	15.0	14.8	14.7
88			
	15.1	14.9	14.8
90			

Add to table, back cover

Moon's Upper Limb
Subtract

Alt. °	11 ′	12 ′	13 ′
0			
	16.7	17.1	17.4
4			
	16.7	17.1	17.4
8			
	16.7	17.0	17.3
12			
	16.7	17.0	17.3
16			
	16.6	17.0	17.2
20			
	16.6	16.9	17.2
24			
	16.6	16.9	17.1
28			
	16.5	16.8	17.0
32			
	16.4	16.7	16.9
36			
	16.4	16.6	16.8
40			
	16.3	16.5	16.7
44			
	16.2	16.4	16.6
48			
	16.1	16.3	16.5
52			
	16.1	16.2	16.3
56			
	16.0	16.1	16.2
60			
	15.9	16.0	16.0
64			
	15.8	15.8	15.9
68			
	15.7	15.7	15.7
72			
	15.6	15.6	15.6
76			
	15.4	15.4	15.4
80			
	15.3	15.3	15.2
84			
	15.2	15.1	15.0
88			
	15.1	15.0	14.9
90			

Subtract from table, back cover

Equation of Time (App.—Mean)

GCT h	11 m s	12 m s	13 m s
0	−10 24.5	−10 08.9	− 9 52.9
6	−10 20.6	−10 04.9	− 9 48.9
12	−10 16.7	−10 00.9	− 9 44.8
18	−10 12.8	− 9 56.9	− 9 40.8
24	−10 08.9	− 9 52.9	− 9 36.7

GCT of Transit Meridian of Greenwich

DAY	Moon h m	Venus h m	Mars h m	Jupiter h m	Saturn h m
11	14 51	13 54	13 15	12 13	0 52
12	15 37	13 54	13 13	12 10	0 47
13	16 24	13 55	13 12	12 06	0 43
14	17 14	13 55	13 11	12 03	0 39

GCT	♈ GHA	VENUS −3.4 GHA	VENUS Dec.	MARS 1.5 GHA	MARS Dec.	JUPITER −1.6 GHA	JUPITER Dec.	SATURN 0.8 GHA	SATURN Dec.	MOON GHA	code	MOON Dec.	code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
0	170 48.3	151 17.6	+ 7 46.7	162 03.2	+ 3 11.9	178 46.4	− 4 33.5	350 15.3	+ 2 31.1	110 11.8	112	+25 53.8	+ 64
1	185 50.7	166 17.2	48.0	177 03.9	12.7	193 48.3	33.3	5 17.9	31.2	124 42.0	111	26 00.2	+ 64
2	200 53.2	181 16.9	49.2	192 04.6	13.5	208 50.2	33.0	20 20.5	31.3	139 12.1	111	26 06.6	+ 62
3	215 55.7	196 16.5	·· 50.5	207 05.3	·· 14.2	223 52.1	·· 32.8	35 23.2	·· 31.3	153 42.2	111	·26 12.8	+ 61
4	230 58.1	211 16.1	51.7	222 06.0	15.0	238 54.0	32.6	50 25.8	31.4	168 12.3	110	26 18.9	+ 60
5	246 00.6	226 15.8	53.0	237 06.7	15.8	253 55.9	32.3	65 28.5	31.5	182 42.3	109	26 24.9	+ 59
6	261 03.0	241 15.4	+ 7 54.3	252 07.4	+ 3 16.6	268 57.8	− 4 32.1	80 31.1	+ 2 31.6	197 12.2	109	+26 30.8	+ 57
7	276 05.5	256 15.1	55.5	267 08.2	17.4	283 59.7	31.9	95 33.8	31.7	211 42.1	109	26 36.5	+ 56
8	291 08.0	271 14.7	56.8	282 08.9	18.1	299 01.6	31.6	110 36.4	31.8	226 12.0	108	26 42.1	+ 55
9	306 10.4	286 14.4	·· 58.0	297 09.6	·· 18.9	314 03.5	·· 31.4	125 39.0	·· 31.8	240 41.8	108	·26 47.6	+ 54
10	321 12.9	301 14.0	7 59.3	312 10.3	19.7	329 05.4	31.1	140 41.7	31.9	255 11.6	107	26 53.0	+ 52
11	336 15.4	316 13.6	8 00.5	327 11.0	20.5	344 07.4	30.9	155 44.3	32.0	269 41.3	107	26 58.2	+ 51
12	351 17.8	331 13.3	+ 8 01.8	342 11.7	+ 3 21.2	359 09.3	− 4 30.7	170 47.0	+ 2 32.1	284 11.0	107	+27 03.3	+ 50
13	6 20.3	346 12.9	03.0	357 12.4	22.0	14 11.2	30.4	185 49.6	32.2	298 40.7	106	27 08.3	+ 49
14	21 22.8	1 12.6	04.2	12 13.1	22.8	29 13.1	30.2	200 52.2	32.2	313 10.3	106	27 13.2	+ 47
15	36 25.2	16 12.2	·· 05.5	27 13.9	·· 23.6	44 15.0	·· 30.0	215 54.9	·· 32.3	327 39.9	105	·27 17.9	+ 46
16	51 27.7	31 11.9	06.7	42 14.6	24.3	59 16.9	29.7	230 57.5	32.4	342 09.4	105	27 22.5	+ 44
17	66 30.2	46 11.5	08.0	57 15.3	25.1	74 18.8	29.5	246 00.2	32.5	356 38.9	105	27 26.9	+ 44
18	81 32.6	61 11.1	+ 8 09.2	72 16.0	+ 3 25.9	89 20.7	− 4 29.2	261 02.8	+ 2 32.6	11 08.4	104	+27 31.3	+ 42
19	96 35.1	76 10.8	10.5	87 16.7	26.7	104 22.6	29.0	276 05.5	32.6	25 37.8	104	27 35.5	+ 40
20	111 37.5	91 10.4	11.7	102 17.4	27.4	119 24.5	28.8	291 08.1	32.7	40 07.2	103	27 39.5	+ 40
21	126 40.0	106 10.1	·· 13.0	117 18.1	·· 28.2	134 26.4	·· 28.5	306 10.7	·· 32.8	54 36.5	103	·27 43.5	+ 38
22	141 42.5	121 09.7	14.2	132 18.8	29.0	149 28.3	28.3	321 13.4	32.9	69 05.8	103	27 47.3	+ 36
23	156 44.9	136 09.3	15.5	147 19.6	29.8	164 30.2	28.1	336 16.0	33.0	83 35.1	102	27 50.9	+ 36
0	171 47.4	151 09.0	+ 8 16.7	162 20.3	+ 3 30.5	179 32.1	− 4 27.8	351 18.7	+ 2 33.0	98 04.3	103	+27 54.5	+ 34
1	186 49.9	166 08.6	18.0	177 21.0	31.3	194 34.0	27.6	6 21.3	33.1	112 33.6	101	27 57.9	+ 33
2	201 52.3	181 08.3	19.2	192 21.7	32.1	209 35.9	27.3	21 24.0	33.2	127 02.7	102	28 01.2	+ 31
3	216 54.8	196 07.9	·· 20.5	207 22.4	·· 32.9	224 37.8	·· 27.1	36 26.6	·· 33.3	141 31.9	101	·28 04.3	+ 30
4	231 57.3	211 07.6	21.7	222 23.1	33.7	239 39.7	26.9	51 29.2	33.4	156 01.0	101	28 07.3	+ 29
5	246 59.7	226 07.2	22.9	237 23.8	34.4	254 41.7	26.6	66 31.9	33.4	170 30.1	101	28 10.2	+ 27
6	262 02.2	241 06.8	+ 8 24.2	252 24.5	+ 3 35.2	269 43.6	− 4 26.4	81 34.5	+ 2 33.5	184 59.2	100	+28 12.9	+ 26
7	277 04.6	256 06.5	25.4	267 25.3	36.0	284 45.5	26.2	96 37.2	33.6	199 28.2	100	28 15.5	+ 25
8	292 07.1	271 06.1	26.7	282 26.0	36.8	299 47.4	25.9	111 39.8	33.7	213 57.2	100	28 18.0	+ 23
9	307 09.6	286 05.7	·· 27.9	297 26.7	·· 37.5	314 49.3	·· 25.7	126 42.5	·· 33.8	228 26.2	100	·28 20.3	+ 22
10	322 12.0	301 05.4	29.2	312 27.4	38.3	329 51.2	25.4	141 45.1	33.9	242 55.2	99	28 22.5	+ 20
11	337 14.5	316 05.0	30.4	327 28.1	39.1	344 53.1	25.2	156 47.7	33.9	257 24.1	99	28 24.5	+ 20
12	352 17.0	331 04.7	+ 8 31.6	342 28.8	+ 3 39.8	359 55.0	− 4 25.0	171 50.4	+ 2 34.0	271 53.0	99	+28 26.5	+ 17
13	7 19.4	346 04.3	32.9	357 29.5	40.6	14 56.9	24.7	186 53.0	34.1	286 21.9	99	28 28.2	+ 17
14	22 21.9	1 03.9	34.1	12 30.2	41.4	29 58.8	24.5	201 55.7	34.2	300 50.8	99	28 29.9	+ 15
15	37 24.4	16 03.6	·· 35.4	27 31.0	·· 42.2	45 00.7	·· 24.3	216 58.3	·· 34.3	315 19.7	98	·28 31.4	+ 14
16	52 26.8	31 03.2	36.6	42 31.7	42.9	60 02.6	24.0	232 00.9	34.3	329 48.5	98	28 32.8	+ 12
17	67 29.3	46 02.8	37.8	57 32.4	43.7	75 04.5	23.8	247 03.6	34.4	344 17.3	98	28 34.0	+ 11
18	82 31.8	61 02.5	+ 8 39.1	72 33.1	+ 3 44.5	90 06.4	− 4 23.6	262 06.2	+ 2 34.5	358 46.1	98	+28 35.1	+ 9
19	97 34.2	76 02.1	40.3	87 33.8	45.3	105 08.3	23.3	277 08.9	34.6	13 14.9	98	28 36.0	+ 9
20	112 36.7	91 01.8	41.6	102 34.5	46.0	120 10.2	23.1	292 11.5	34.7	27 43.7	97	28 36.9	+ 6
21	127 39.1	106 01.4	·· 42.8	117 35.2	·· 46.8	135 12.1	·· 22.8	307 14.2	·· 34.7	42 12.4	98	·28 37.5	+ 6
22	142 41.6	121 01.0	44.0	132 35.9	47.6	150 14.0	22.6	322 16.8	34.8	56 41.2	97	28 38.1	+ 4
23	157 44.1	136 00.7	45.3	147 36.7	48.4	165 16.0	22.4	337 19.4	34.9	71 09.9	98	28 38.5	+ 2
0	172 46.5	151 00.3	+ 8 46.5	162 37.4	+ 3 49.1	180 17.9	− 4 22.1	352 22.1	+ 2 35.0	85 38.7	97	+28 38.7	+ 1
1	187 49.0	165 59.9	47.7	177 38.1	49.9	195 19.8	21.9	7 24.7	35.1	100 07.4	97	28 38.8	0
2	202 51.5	180 59.6	49.0	192 38.8	50.7	210 21.7	21.7	22 27.4	35.1	114 36.1	97	28 38.8	− 1
3	217 53.9	195 59.2	·· 50.2	207 39.5	·· 51.5	225 23.6	·· 21.4	37 30.0	·· 35.2	129 04.8	97	·28 38.7	− 3
4	232 56.4	210 58.8	51.5	222 40.2	52.2	240 25.5	21.2	52 32.7	35.3	143 33.5	97	28 38.4	− 5
5	247 58.9	225 58.5	52.7	237 40.9	53.0	255 27.4	20.9	67 35.3	35.4	158 02.2	97	28 37.9	− 5
6	263 01.3	240 58.1	+ 8 53.9	252 41.6	+ 3 53.8	270 29.3	− 4 20.7	82 37.9	+ 2 35.5	172 30.9	96	+28 37.4	− 8
7	278 03.8	255 57.8	55.2	267 42.4	54.5	285 31.2	20.5	97 40.6	35.5	186 59.5	97	28 36.6	− 8
8	293 06.3	270 57.4	56.4	282 43.1	55.3	300 33.1	20.2	112 43.2	35.6	201 28.2	97	28 35.8	− 10
9	308 08.7	285 57.0	·· 57.6	297 43.8	·· 56.1	315 35.0	·· 20.0	127 45.9	·· 35.7	215 56.9	97	·28 34.8	− 12
10	323 11.2	300 56.7	8 58.9	312 44.5	56.9	330 36.9	19.8	142 48.5	35.8	230 25.6	97	28 33.6	− 12
11	338 13.6	315 56.3	9 00.1	327 45.2	57.6	345 38.8	19.5	157 51.2	35.9	244 54.3	97	28 32.4	− 14
12	353 16.1	330 55.9	+ 9 01.3	342 45.9	+ 3 58.4	0 40.7	− 4 19.3	172 53.8	+ 2 36.0	259 23.0	97	+28 31.0	− 16
13	8 18.6	345 55.6	02.6	357 46.6	59.2	15 42.6	19.0	187 56.4	36.0	273 51.7	97	28 29.4	− 17
14	23 21.0	0 55.2	03.8	12 47.4	3 59.9	30 44.5	18.8	202 59.1	36.1	288 20.4	97	28 27.7	− 18
15	38 23.5	15 54.8	·· 05.0	27 48.1	· 4 00.7	45 46.4	·· 18.6	218 01.7	·· 36.2	302 49.1	97	·28 25.9	− 20
16	53 26.0	30 54.4	06.3	42 48.8	01.5	60 48.4	18.3	233 04.4	36.3	317 17.8	97	28 23.9	− 21
17	68 28.4	45 54.1	07.5	57 49.5	02.3	75 50.3	18.1	248 07.0	36.4	331 46.5	97	28 21.8	− 23
18	83 30.9	60 53.7	+ 9 08.7	72 50.2	+ 4 03.0	90 52.2	− 4 17.9	263 09.7	+ 2 36.4	346 15.2	97	+28 19.5	− 24
19	98 33.4	75 53.3	10.0	87 50.9	03.8	105 54.1	17.6	278 12.3	36.5	0 43.9	98	28 17.1	− 25
20	113 35.8	90 53.0	11.2	102 51.6	04.6	120 56.0	17.4	293 15.0	36.6	15 12.7	98	28 14.6	− 27
21	128 38.3	105 52.6	·· 12.4	117 52.3	·· 05.3	135 57.9	·· 17.1	308 17.6	·· 36.7	29 41.5	97	·28 11.9	− 28
22	143 40.7	120 52.2	13.6	132 53.1	06.1	150 59.8	16.9	323 20.2	36.8	44 10.2	98	28 09.1	− 29
23	158 43.2	135 51.9	14.9	147 53.8	06.9	166 01.7	16.7	338 22.9	36.8	58 39.0	98	28 06.2	− 31
24	173 45.7	150 51.5	+ 9 16.1	162 54.5	+ 4 07.7	181 03.6	− 4 16.4	353 25.5	+ 2 36.9	73 07.8	98	+28 03.1	− 32
code	—	− 4	+ 13	+ 7	+ 8	+ 19	+ 3	+ 26	+ 1				

GCT	SUN GHA	SUN Dec.
h	° ′	° ′
0	177 35.9	− 2 56.2
1	192 36.1	55.2
2	207 36.3	54.2
3	222 36.4 ··	53.2
4	237 36.6	52.3
5	252 36.8	51.3
6	267 36.9	− 2 50.3
7	282 37.1	49.3
8	297 37.3	48.3
9	312 37.5 ··	47.3
10	327 37.6	46.3
11	342 37.8	45.4
12	357 38.0	− 2 44.4
13	12 38.1	43.4
14	27 38.3	42.4
15	42 38.5 ··	41.4
16	57 38.7	40.4
17	72 38.8	39.4
18	87 39.0	− 2 38.5
19	102 39.2	37.5
20	117 39.4	36.5
21	132 39.5 ··	35.5
22	147 39.7	34.5
23	162 39.9	33.5
0	177 40.1	− 2 32.5
1	192 40.2	31.6
2	207 40.4	30.6
3	222 40.6 ··	29.6
4	237 40.7	28.6
5	252 40.9	27.6
6	267 41.1	− 2 26.6
7	282 41.3	25.6
8	297 41.4	24.7
9	312 41.6 ··	23.7
10	327 41.8	22.7
11	342 42.0	21.7
12	357 42.1	− 2 20.7
13	12 42.3	19.7
14	27 42.5	18.7
15	42 42.7 ··	17.7
16	57 42.8	16.8
17	72 43.0	15.8
18	87 43.2	− 2 14.8
19	102 43.4	13.8
20	117 43.5	12.8
21	132 43.7 ··	11.8
22	147 43.9	10.8
23	162 44.1	09.9
0	177 44.3	− 2 08.9
1	192 44.4	07.9
2	207 44.6	06.9
3	222 44.8 ··	05.9
4	237 45.0	04.9
5	252 45.1	03.9
6	267 45.3	− 2 02.9
7	282 45.5	02.0
8	297 45.7	01.0
9	312 45.8 ·	2 00.0
10	327 46.0	1 59.0
11	342 46.2	58.0
12	357 46.4	− 1 57.0
13	12 46.6	56.0
14	27 46.7	55.0
15	42 46.9 ··	54.1
16	57 47.1	53.1
17	72 47.3	52.1
18	87 47.4	− 1 51.1
19	102 47.6	50.1
20	117 47.8	49.1
21	132 48.0 ··	48.1
22	147 48.2	47.1
23	162 48.3	46.2
24	177 48.5	− 1 45.2
code	→	+ 10

STARS No.	SHA	Dec.	Transit Mer. Gr.
	° ′	° ′	h m
1	358 32.5	+28 49.2	12 37
2	358 22.4	+58 52.8	12 37
3	349 43.1	−18 15.4	13 12
4	339 21.7	+59 59.1	13 53
5	336 01.7	−57 29.2	14 06
6	332 59.2	+89 02.3	14 19
7	328 54.0	+23 14.0	14 35
8	315 54.0	−40 30.1	15 27
9	309 47.9	+49 41.6	15 51
10	291 43.3	+16 24.9	17 03
11	281 57.1	− 8 15.4	17 42
12	281 43.8	+45 57.3	17 43
13	279 22.3	+ 6 18.5	17 52
14	279 11.9	+28 34.3	17 53
15	276 33.9	− 1 13.9	18 04
16	271 52.0	+ 7 24.0	18 22
17	264 16.9	−52 40.3	18 53
18	259 14.9	−16 38.9	19 13
19	255 49.2	−28 54.4	19 26
20	245 48.6	+ 5 21.1	20 06
21	244 24.7	+28 08.9	20 12
22	234 37.0	−59 21.3	20 51
23	223 26.7	−43 14.2	21 36
24	221 49.5	−69 31.1	21 42
25	218 41.9	− 8 26.8	21 54
26	208 33.0	+12 12.3	22 35
27	194 48.0	+62 00.9	23 30
28	183 21.0	+14 50.5	0 19
29	174 01.5	−62 49.8	0 57
30	172 52.9	−56 50.5	1 01
31	168 46.8	−59 25.4	1 18
32	167 00.9	+56 13.2	1 25
33	159 29.8	+55 10.5	1 55
34	159 20.4	−10 54.6	1 55
35	153 35.1	+49 33.1	2 18
36	149 02.7	−36 07.9	2 36
37	146 38.1	+19 25.8	2 46
38	140 55.7	−60 38.2	3 09
39	137 16.5	+74 20.9	3 23
40	126 50.4	+26 52.3	4 05
41	120 38.2	−22 29.2	4 30
42	113 23.7	−26 19.7	4 58
43	109 07.6	−68 56.4	5 15
44	103 06.3	−15 40.2	5 39
45	97 25.6	−37 04.3	6 02
46	96 49.9	+12 35.3	6 05
47	91 07.9	+51 29.2	6 27
48	84 46.0	−34 24.7	6 53
49	81 10.8	+38 43.8	7 07
50	76 56.4	−26 21.7	7 24
51	62 54.1	+ 8 44.0	8 20
52	54 33.2	−56 53.6	8 53
53	50 03.9	+45 06.0	9 11
54	34 33.4	+ 9 38.8	10 13
55	28 42.7	−47 11.9	10 36
56	16 15.8	−29 53.0	11 26
57	14 25.4	+14 56.4	11 33

Lat.	Sunrise	Twlt. begins	Moonrise 14	15	16	17
N °	h m	h m	h m	h m	h m	h m
70	6 26	2 45	□	□	□	□
68	6 24	3 08	□	□	□	□
66	6 23	3 26	□	□	□	□
64	6 21	3 40	□	□	□	□
62	6 20	3 50	6 15	□	□	8 14
60	6 19	4 00	6 54	7 10	7 53	9 11
58	6 18	4 07	7 22	7 48	8 34	9 45
56	6 18	4 14	7 43	8 14	9 02	10 09
54	6 17	4 20	8 01	8 35	9 24	10 28
52	6 16	4 24	8 16	8 52	9 42	10 45
50	6 16	4 29	8 29	9 07	9 57	10 59
45	6 14	4 38	8 57	9 38	10 28	11 28
40	6 13	4 45	9 18	10 01	10 52	11 50
35	6 12	4 49	9 36	10 21	11 12	12 09
30	6 11	4 52	9 51	10 37	11 29	12 25
20	6 09	4 57	10 18	11 06	11 57	12 51
10	6 08	4 58	10 41	11 30	12 22	13 15
0	6 06	4 57	11 02	11 53	12 45	13 36
10	6 04	4 54	11 23	12 15	13 07	13 58
20	6 02	4 48	11 46	12 40	13 32	14 21
30	6 00	4 39	12 13	13 08	14 00	14 47
35	5 58	4 33	12 29	13 25	14 17	15 03
40	5 57	4 24	12 47	13 45	14 37	15 21
45	5 55	4 14	13 10	14 09	15 01	15 43
50	5 52	3 59	13 39	14 40	15 31	16 11
52	5 51	3 53	13 53	14 56	15 47	16 24
54	5 50	3 44	14 09	15 14	16 04	16 40
56	5 49	3 35	14 29	15 36	16 26	16 58
58	5 47	3 24	14 53	16 05	16 53	17 20
60	5 46	3 11	15 26	16 47	17 33	17 49
S						

Lat.	Sunset	Twlt. ends	Moonset 14	15	16	17
N °	h m	h m	h m	h m	h m	h m
70	17 55	21 43	□	□	□	□
68	17 56	21 17	□	□	□	□
66	17 57	20 59	□	□	□	□
64	17 59	20 45	□	□	□	□
62	18 00	20 34	3 15	□	□	6 37
60	18 01	20 24	2 36	4 05	5 09	5 39
58	18 01	20 15	2 09	3 28	4 29	5 06
56	18 02	20 08	1 48	3 02	4 01	4 41
54	18 03	20 03	1 30	2 41	3 39	4 22
52	18 03	19 57	1 16	2 24	3 21	4 05
50	18 04	19 53	1 03	2 09	3 06	3 51
45	18 05	19 43	0 36	1 39	2 34	3 21
40	18 06	19 36	0 15	1 16	2 11	2 58
35	18 07	19 31	24 56	0 56	1 51	2 40
30	18 08	19 28	24 40	0 40	1 34	2 23
20	18 09	19 22	24 12	0 12	1 05	1 56
10	18 11	19 21	23 48	24 41	0 41	1 32
0	18 12	19 21	23 26	24 18	0 18	1 09
10	18 14	19 24	23 04	23 55	24 47	0 47
20	18 16	19 29	22 40	23 30	24 23	0 23
30	18 18	19 38	22 13	23 01	23 55	24 53
35	18 19	19 44	21 56	22 44	23 38	24 38
40	18 21	19 53	21 37	22 24	23 19	24 20
45	18 23	20 03	21 14	22 00	22 55	23 59
50	18 25	20 16	20 45	21 29	22 25	23 32
52	18 26	20 23	20 31	21 13	22 10	23 18
54	18 27	20 31	20 14	20 55	21 52	23 03
56	18 28	20 39	19 54	20 33	21 31	22 45
58	18 30	20 50	19 30	20 04	21 04	22 23
60	18 31	21 02	18 56	19 22	20 24	21 55
S						

GCT	Equation of Time (App.—Mean) 14	15	16
h	m s	m s	m s
0	− 9 36.7	− 9 20.2	− 9 03.3
6	− 9 32.6	− 9 16.0	− 8 59.1
12	− 9 28.4	− 9 11.8	− 8 54.8
18	− 9 24.3	− 9 07.6	− 8 50.6
24	− 9 20.2	− 9 03.3	− 8 46.3

GCT of Transit Meridian of Greenwich

DAY	Moon	Venus	Mars	Jupiter	Saturn
	h m	h m	h m	h m	h m
14	17 14	13 55	13 11	12 03	0 39
15	18 05	13 56	13 10	12 00	0 35
16	18 57	13 56	13 09	11 57	0 30
17	19 48	13 57	13 08	11 54	0 26

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb	Venus	Mars
°	′	′	′
0 – 30	0.4	0.1	0.1
30 – 45	0.4	0.1	0.0
45 – 60	0.4	0.1	0.0
60 – 75	0.4	0.0	0.0
75 – 90	0.4	0.0	0.0

Moon's Lower Limb
Add

Alt.	14	15	16
°	′	′	′
0 – 4	12.1	12.0	12.2
4 – 8	12.1	12.0	12.3
8 – 12	12.2	12.0	12.3
12 – 16	12.2	12.1	12.3
16 – 20	12.2	12.1	12.4
20 – 24	12.3	12.2	12.4
24 – 28	12.4	12.3	12.5
28 – 32	12.5	12.4	12.6
32 – 36	12.6	12.5	12.7
36 – 40	12.7	12.6	12.8
40 – 44	12.8	12.7	12.9
44 – 48	12.9	12.8	13.0
48 – 52	13.1	13.0	13.2
52 – 56	13.2	13.1	13.3
56 – 60	13.4	13.3	13.5
60 – 64	13.5	13.5	13.6
64 – 68	13.7	13.6	13.8
68 – 72	13.9	13.8	14.0
72 – 76	14.1	14.0	14.1
76 – 80	14.3	14.2	14.3
80 – 84	14.4	14.4	14.5
84 – 88	14.6	14.6	14.7
88 – 90	14.8	14.7	14.8

Add to table, back cover

Moon's Upper Limb
Subtract

Alt.	14	15	16
°	′	′	′
0 – 4	17.5	17.6	17.4
4 – 8	17.5	17.6	17.4
8 – 12	17.5	17.5	17.4
12 – 16	17.4	17.5	17.4
16 – 20	17.4	17.5	17.3
20 – 24	17.3	17.4	17.3
24 – 28	17.2	17.3	17.2
28 – 32	17.2	17.2	17.1
32 – 36	17.1	17.1	17.0
36 – 40	16.9	17.0	16.9
40 – 44	16.8	16.9	16.8
44 – 48	16.7	16.7	16.6
48 – 52	16.6	16.6	16.5
52 – 56	16.4	16.4	16.4
56 – 60	16.2	16.3	16.2
60 – 64	16.1	16.1	16.1
64 – 68	15.9	15.9	15.9
68 – 72	15.7	15.7	15.7
72 – 76	15.6	15.6	15.6
76 – 80	15.4	15.4	15.4
80 – 84	15.2	15.2	15.2
84 – 88	15.0	15.0	15.0
88 – 90	14.9	14.8	14.9

Subtract from table, back cover

First Quarter 15

GCT	♈	VENUS −3.4		MARS 1.5		JUPITER −1.6		SATURN 0.8		MOON			
	GHA	GHA	Dec.	GHA	Dec.	GHA	Dec.	GHA	Dec.	GHA	code	Dec.	code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
0	173 45.7	150 51.5	+ 9 16.1	162 54.5	+ 4 07.7	181 03.6	− 4 16.4	353 25.5	+ 2 36.9	73 07.8	98	+28 03.1	− 32
1	188 48.1	165 51.1	17.3	177 55.2	08.4	196 05.5	16.2	8 28.2	37.0	87 36.6	99	27 59.9	− 34
2	203 50.6	180 50.8	18.6	192 55.9	09.2	211 07.4	16.0	23 30.8	37.1	102 05.5	98	27 56.5	− 35
3	218 53.1	195 50.4	·· 19.8	207 56.6	·· 10.0	226 09.3	·· 15.7	38 33.5	·· 37.2	116 34.3	99	·27 53.0	− 36
4	233 55.5	210 50.0	21.0	222 57.3	10.7	241 11.2	15.5	53 36.1	37.2	131 03.2	99	27 49.4	− 38
5	248 58.0	225 49.6	22.2	237 58.0	11.5	256 13.1	15.2	68 38.7	37.3	145 32.1	99	27 45.6	− 39
6	264 00.5	240 49.3	+ 9 23.5	252 58.8	+ 4 12.3	271 15.0	− 4 15.0	83 41.4	+ 2 37.4	160 01.0	99	+27 41.7	− 41
7	279 02.9	255 48.9	24.7	267 59.5	13.1	286 16.9	14.8	98 44.0	37.5	174 29.9	100	27 37.6	− 42
8	294 05.4	270 48.5	25.9	283 00.2	13.8	301 18.8	14.5	113 46.7	37.6	188 58.9	100	27 33.4	− 43
9	309 07.9	285 48.2	·· 27.2	298 00.9	·· 14.6	316 20.8	·· 14.3	128 49.3	·· 37.6	203 27.9	100	·27 29.1	− 45
10	324 10.3	300 47.8	28.4	313 01.6	15.4	331 22.7	14.1	143 52.0	37.7	217 56.9	100	27 24.6	− 46
11	339 12.8	315 47.4	29.6	328 02.3	16.1	346 24.6	13.8	158 54.6	37.8	232 25.9	100	27 20.0	− 47
12	354 15.2	330 47.0	+ 9 30.8	343 03.0	+ 4 16.9	1 26.5	− 4 13.6	173 57.2	+ 2 37.9	246 54.9	101	+27 15.3	− 48
13	9 17.7	345 46.7	32.1	358 03.8	17.7	16 28.4	13.4	188 59.9	38.0	261 24.0	101	27 10.5	− 50
14	24 20.2	0 46.3	33.3	13 04.5	18.4	31 30.3	13.1	204 02.5	38.0	275 53.1	102	27 05.5	− 52
15	39 22.6	15 45.9	·· 34.5	28 05.2	·· 19.2	46 32.2	·· 12.9	219 05.2	·· 38.1	290 22.3	101	·27 00.3	− 53
16	54 25.1	30 45.6	35.7	43 05.9	20.0	61 34.1	12.6	234 07.8	38.2	304 51.4	102	26 55.0	− 54
17	69 27.6	45 45.2	36.9	58 06.6	20.8	76 36.0	12.4	249 10.5	38.3	319 20.6	102	26 49.6	− 55
18	84 30.0	60 44.8	+ 9 38.2	73 07.3	+ 4 21.5	91 37.9	− 4 12.2	264 13.1	+ 2 38.4	333 49.8	103	+26 44.1	− 57
19	99 32.5	75 44.4	39.4	88 08.0	22.3	106 39.8	11.9	279 15.8	38.5	348 19.1	103	26 38.4	− 58
20	114 35.0	90 44.1	40.6	103 08.7	23.1	121 41.7	11.7	294 18.4	38.5	2 48.4	103	26 32.6	− 59
21	129 37.4	105 43.7	·· 41.8	118 09.5	·· 23.8	136 43.6	·· 11.5	309 21.0	·· 38.6	17 17.7	104	·26 26.7	− 61
22	144 39.9	120 43.3	43.1	133 10.2	24.6	151 45.5	11.2	324 23.7	38.7	31 47.1	103	26 20.6	− 62
23	159 42.4	135 42.9	44.3	148 10.9	25.4	166 47.4	11.0	339 26.3	38.8	46 16.4	105	26 14.4	− 63
0	174 44.8	150 42.6	+ 9 45.5	163 11.6	+ 4 26.1	181 49.4	− 4 10.7	354 29.0	+ 2 38.9	60 45.9	104	+26 08.1	− 64
1	189 47.3	165 42.2	46.7	178 12.3	26.9	196 51.3	10.5	9 31.6	38.9	75 15.3	105	26 01.7	− 66
2	204 49.7	180 41.8	47.9	193 13.0	27.7	211 53.2	10.3	24 34.3	39.0	89 44.8	105	25 55.1	− 68
3	219 52.2	195 41.4	·· 49.1	208 13.7	·· 28.4	226 55.1	·· 10.0	39 36.9	·· 39.1	104 14.3	106	·25 48.3	− 68
4	234 54.7	210 41.1	50.4	223 14.5	29.2	241 57.0	09.8	54 39.5	39.2	118 43.9	106	25 41.5	− 70
5	249 57.1	225 40.7	51.6	238 15.2	30.0	256 58.9	09.6	69 42.2	39.3	133 13.5	107	25 34.5	− 71
6	264 59.6	240 40.3	+ 9 52.8	253 15.9	+ 4 30.7	272 00.8	− 4 09.3	84 44.8	+ 2 39.3	147 43.2	106	+25 27.4	− 72
7	280 02.1	255 39.9	54.0	268 16.6	31.5	287 02.7	09.1	99 47.5	39.4	162 12.8	108	25 20.2	− 74
8	295 04.5	270 39.6	55.2	283 17.3	32.3	302 04.6	08.8	114 50.1	39.5	176 42.6	107	25 12.8	− 74
9	310 07.0	285 39.2	·· 56.5	298 18.0	·· 33.0	317 06.5	·· 08.6	129 52.8	·· 39.6	191 12.3	108	·25 05.4	− 77
10	325 09.5	300 38.8	57.7	313 18.7	33.8	332 08.4	08.4	144 55.4	39.7	205 42.1	108	24 57.7	− 77
11	340 11.9	315 38.4	9 58.9	328 19.4	34.6	347 10.3	08.1	159 58.1	39.7	220 11.9	109	24 50.0	− 78
12	355 14.4	330 38.0	+10 00.1	343 20.2	+ 4 35.3	2 12.2	− 4 07.9	175 00.7	+ 2 39.8	234 41.8	109	+24 42.2	− 80
13	10 16.9	345 37.7	01.3	358 20.9	36.1	17 14.1	07.7	190 03.3	39.9	249 11.7	110	24 34.2	− 81
14	25 19.3	0 37.3	02.5	13 21.6	36.9	32 16.0	07.4	205 06.0	40.0	263 41.7	110	24 26.1	− 83
15	40 21.8	15 36.9	·· 03.7	28 22.3	·· 37.6	47 18.0	·· 07.2	220 08.6	·· 40.1	278 11.7	110	·24 17.8	− 83
16	55 24.2	30 36.5	05.0	43 23.0	38.4	62 19.9	07.0	235 11.3	40.1	292 41.7	111	24 09.5	− 85
17	70 26.7	45 36.2	06.2	58 23.7	39.2	77 21.8	06.7	250 13.9	40.2	307 11.8	111	24 01.0	− 86
18	85 29.2	60 35.8	+10 07.4	73 24.4	+ 4 39.9	92 23.7	− 4 06.5	265 16.6	+ 2 40.3	321 41.9	112	+23 52.4	− 87
19	100 31.6	75 35.4	08.6	88 25.2	40.7	107 25.6	06.2	280 19.2	40.4	336 12.1	112	23 43.7	− 88
20	115 34.1	90 35.0	09.8	103 25.9	41.5	122 27.5	06.0	295 21.9	40.5	350 42.3	113	23 34.9	− 90
21	130 36.6	105 34.6	·· 11.0	118 26.6	·· 42.2	137 29.4	·· 05.8	310 24.5	·· 40.5	5 12.6	112	·23 25.9	− 90
22	145 39.0	120 34.3	12.2	133 27.3	43.0	152 31.3	05.5	325 27.1	40.6	19 42.8	114	23 16.9	− 92
23	160 41.5	135 33.9	13.4	148 28.0	43.8	167 33.2	05.3	340 29.8	40.7	34 13.2	114	23 07.7	− 93
0	175 44.0	150 33.5	+10 14.7	163 28.7	+ 4 44.5	182 35.1	− 4 05.1	355 32.4	+ 2 40.8	48 43.6	114	+22 58.4	− 95
1	190 46.4	165 33.1	15.9	178 29.4	45.3	197 37.0	04.8	10 35.1	40.9	63 14.0	114	22 48.9	− 95
2	205 48.9	180 32.7	17.1	193 30.2	46.1	212 38.9	04.6	25 37.7	40.9	77 44.4	115	22 39.4	− 97
3	220 51.3	195 32.4	·· 18.3	208 30.9	·· 46.8	227 40.8	·· 04.3	40 40.4	·· 41.0	92 14.9	116	·22 29.7	− 97
4	235 53.8	210 32.0	19.5	223 31.6	47.6	242 42.7	04.1	55 43.0	41.1	106 45.5	116	22 20.0	− 99
5	250 56.3	225 31.6	20.7	238 32.3	48.4	257 44.7	03.9	70 45.6	41.2	121 16.1	116	22 10.1	−100
6	265 58.7	240 31.2	+10 21.9	253 33.0	+ 4 49.1	272 46.6	− 4 03.6	85 48.3	+ 2 41.3	135 46.7	117	+22 00.1	−101
7	281 01.2	255 30.8	23.1	268 33.7	49.9	287 48.5	03.4	100 50.9	41.3	150 17.4	117	21 50.0	−102
8	296 03.7	270 30.4	24.3	283 34.4	50.7	302 50.4	03.2	115 53.6	41.4	164 48.1	118	21 39.8	−104
9	311 06.1	285 30.1	·· 25.5	298 35.1	·· 51.4	317 52.3	·· 02.9	130 56.2	·· 41.5	179 18.9	118	·21 29.4	−104
10	326 08.6	300 29.7	26.7	313 35.9	52.2	332 54.2	02.7	145 58.9	41.6	193 49.7	119	21 19.0	−106
11	341 11.1	315 29.3	27.9	328 36.6	53.0	347 56.1	02.5	161 01.5	41.7	208 20.6	119	21 08.4	−106
12	356 13.5	330 28.9	+10 29.1	343 37.3	+ 4 53.7	2 58.0	− 4 02.2	176 04.2	+ 2 41.7	222 51.5	119	+20 57.8	−108
13	11 16.0	345 28.5	30.3	358 38.0	54.5	17 59.9	02.0	191 06.8	41.8	237 22.4	120	20 47.0	−108
14	26 18.5	0 28.1	31.6	13 38.7	55.3	33 01.8	01.7	206 09.4	41.9	251 53.4	120	20 36.2	−110
15	41 20.9	15 27.8	·· 32.8	28 39.4	·· 56.0	48 03.7	·· 01.5	221 12.1	·· 42.0	266 24.4	121	·20 25.2	−111
16	56 23.4	30 27.4	34.0	43 40.1	56.8	63 05.6	01.3	236 14.7	42.1	280 55.5	121	20 14.1	−112
17	71 25.8	45 27.0	35.2	58 40.9	57.5	78 07.5	01.0	251 17.4	42.2	295 26.6	121	20 02.9	−113
18	86 28.3	60 26.6	+10 36.4	73 41.6	+ 4 58.3	93 09.4	− 4 00.8	266 20.0	+ 2 42.2	309 57.7	122	+19 51.6	−114
19	101 30.8	75 26.2	37.6	88 42.3	59.1	108 11.4	00.6	281 22.7	42.3	324 28.9	122	19 40.2	−115
20	116 33.2	90 25.8	38.8	103 43.0	4 59.8	123 13.3	00.3	296 25.3	42.4	339 00.1	123	19 28.7	−116
21	131 35.7	105 25.4	·· 40.0	118 43.7	· 5 00.6	138 15.2	· 4 00.1	311 28.0	·· 42.5	353 31.4	123	·19 17.1	−117
22	146 38.2	120 25.1	41.2	133 44.4	01.4	153 17.1	3 59.8	326 30.6	42.6	8 02.7	123	19 05.4	−118
23	161 40.6	135 24.7	42.4	148 45.1	02.1	168 19.0	59.6	341 33.2	42.6	22 34.0	124	18 53.6	−119
24	176 43.1	150 24.3	+10 43.6	163 45.8	+ 5 02.9	183 20.9	− 3 59.4	356 35.9	+ 2 42.7	37 05.4	124	+18 41.7	−120
code	—	− 3	+ 12	+ 7	+ 8	+ 19	+ 2	+ 26	+ 1				

GCT	SUN GHA	SUN Dec.
h	° ′	° ′
0	177 48.5	− 1 45.2
1	192 48.7	44.2
2	207 48.9	43.2
3	222 49.1 ••	42.2
4	237 49.2	41.2
5	252 49.4	40.2
6	267 49.6	− 1 39.2
7	282 49.8	38.2
8	297 50.0	37.3
9	312 50.1 ••	36.3
10	327 50.3	35.3
11	342 50.5	34.3
12	357 50.7	− 1 33.3
13	12 50.9	32.3
14	27 51.0	31.3
15	42 51.2 ••	30.3
16	57 51.4	29.4
17	72 51.6	28.4
18	87 51.8	− 1 27.4
19	102 51.9	26.4
20	117 52.1	25.4
21	132 52.3 ••	24.4
22	147 52.5	23.4
23	162 52.7	22.4
0	177 52.8	− 1 21.5
1	192 53.0	20.5
2	207 53.2	19.5
3	222 53.4 ••	18.5
4	237 53.6	17.5
5	252 53.7	16.5
6	267 53.9	− 1 15.5
7	282 54.1	14.5
8	297 54.3	13.5
9	312 54.5 ••	12.6
10	327 54.7	11.6
11	342 54.8	10.6
12	357 55.0	− 1 09.6
13	12 55.2	08.6
14	27 55.4	07.6
15	42 55.6 ••	06.6
16	57 55.8	05.6
17	72 55.9	04.7
18	87 56.1	− 1 03.7
19	102 56.3	02.7
20	117 56.5	01.7
21	132 56.7 •	1 00.7
22	147 56.8	0 59.7
23	162 57.0	58.7
0	177 57.2	− 0 57.7
1	192 57.4	56.7
2	207 57.6	55.8
3	222 57.8 ••	54.8
4	237 57.9	53.8
5	252 58.1	52.8
6	267 58.3	− 0 51.8
7	282 58.5	50.8
8	297 58.7	49.8
9	312 58.9 ••	48.8
10	327 59.0	47.9
11	342 59.2	46.9
12	357 59.4	− 0 45.9
13	12 59.6	44.9
14	27 59.8	43.9
15	43 00.0 ••	42.9
16	58 00.2	41.9
17	73 00.3	40.9
18	88 00.5	− 0 39.9
19	103 00.7	39.0
20	118 00.9	38.0
21	133 01.1 ••	37.0
22	148 01.3	36.0
23	163 01.4	35.0
24	178 01.6	− 0 34.0
code	—	+ 10

STARS No.	SHA	Dec.	Transit Mer. Gr.
	° ′	° ′	h m
1	358 32.5	+28 49.2	12 25
2	358 22.4	+58 52.8	12 25
3	349 43.1	−18 15.3	13 00
4	339 21.7	+59 59.1	13 41
5	336 01.8	−57 29.1	13 55
6	332 59.7	+89 02.3	14 07
7	328 54.0	+23 14.0	14 23
8	315 54.0	−40 30.1	15 15
9	309 47.9	+49 41.6	15 39
10	291 43.3	+16 24.9	16 51
11	281 57.1	− 8 15.4	17 30
12	281 43.8	+45 57.3	17 31
13	279 22.3	+ 6 18.5	17 41
14	279 11.9	+28 34.3	17 41
15	276 33.9	− 1 13.9	17 52
16	271 52.0	+ 7 24.0	18 11
17	264 16.9	−52 40.3	18 41
18	259 14.9	−16 38.9	19 01
19	255 49.3	−28 54.4	19 15
20	245 48.6	+ 5 21.1	19 55
21	244 24.7	+28 08.9	20 00
22	234 37.0	−59 21.3	20 39
23	223 26.8	−43 14.2	21 24
24	221 49.5	−69 31.1	21 30
25	218 41.9	− 8 26.9	21 43
26	208 33.0	+12 12.3	22 23
27	194 48.0	+62 00.9	23 18
28	183 21.0	+14 50.5	0 08
29	174 01.5	−62 49.8	0 45
30	172 52.9	−56 50.5	0 49
31	168 46.8	−59 25.4	1 06
32	167 00.9	+56 13.3	1 13
33	159 29.8	+55 10.5	1 43
34	159 20.4	−10 54.6	1 43
35	153 35.1	+49 33.1	2 06
36	149 02.7	−36 08.0	2 24
37	146 38.1	+19 25.8	2 34
38	140 55.7	−60 38.2	2 57
39	137 16.4	+74 20.9	3 11
40	126 50.4	+26 52.3	3 53
41	120 38.2	−22 29.2	4 18
42	113 23.7	−26 19.7	4 47
43	109 07.6	−68 56.4	5 04
44	103 06.2	−15 40.2	5 28
45	97 25.5	−37 04.3	5 50
46	96 49.9	+12 35.3	5 53
47	91 07.9	+51 29.2	6 15
48	84 46.0	−34 24.7	6 41
49	81 10.8	+38 43.8	6 55
50	76 56.4	−26 21.7	7 12
51	62 54.1	+ 8 44.0	8 08
52	54 33.1	−56 53.6	8 41
53	50 03.9	+45 06.0	8 59
54	34 33.4	+ 9 38.8	10 01
55	28 42.7	−47 11.9	10 24
56	16 15.8	−29 53.0	11 14
57	14 25.4	+14 56.4	11 21

Lat.	Sunrise	Twlt. begins	Moonrise 17	18	19	20
N °	h m	h m	h m	h m	h m	h m
70	6 12	2 23	▭	▭	▭	12 28
68	6 11	2 51	▭	▭	10 11	12 57
66	6 11	3 11	▭	▭	11 09	13 19
64	6 11	3 26	▭	9 27	11 42	13 36
62	6 10	3 39	8 14	10 16	12 06	13 51
60	6 10	3 49	9 11	10 47	12 25	14 02
58	6 10	3 58	9 45	11 10	12 41	14 13
56	6 10	4 05	10 09	11 29	12 54	14 22
54	6 09	4 12	10 28	11 44	13 06	14 29
52	6 09	4 17	10 45	11 58	13 16	14 36
50	6 09	4 22	10 59	12 10	13 25	14 43
45	6 08	4 32	11 28	12 34	13 44	14 56
40	6 08	4 39	11 50	12 53	13 59	15 07
35	6 08	4 45	12 09	13 10	14 13	15 16
30	6 07	4 49	12 25	13 23	14 24	15 25
20	6 07	4 54	12 51	13 47	14 43	15 39
10	6 06	4 56	13 15	14 08	15 00	15 51
0	6 05	4 56	13 36	14 27	15 15	16 02
10	6 04	4 54	13 58	14 46	15 31	16 14
20	6 03	4 50	14 21	15 06	15 47	16 26
30	6 01	4 41	14 47	15 29	16 06	16 40
35	6 01	4 35	15 03	15 43	16 17	16 48
40	6 00	4 28	15 21	15 58	16 30	16 57
45	5 59	4 18	15 43	16 17	16 44	17 07
50	5 57	4 05	16 11	16 40	17 02	17 20
52	5 56	3 59	16 24	16 51	17 11	17 26
54	5 56	3 52	16 40	17 04	17 20	17 32
56	5 55	3 43	16 58	17 18	17 30	17 39
58	5 54	3 34	17 20	17 35	17 42	17 47
60	5 53	3 21	17 49	17 55	17 56	17 56
S						

Lat.	Sunset	Twlt. ends	Moonset 17	18	19	20
N °	h m	h m	h m	h m	h m	h m
70	18 07	22 05	▭	▭	▭	7 35
68	18 07	21 35	▭	▭	8 11	7 04
66	18 07	21 13	▭	▭	7 12	6 41
64	18 08	20 57	▭	7 11	6 38	6 22
62	18 08	20 44	6 37	6 21	6 13	6 07
60	18 08	20 33	5 39	5 50	5 53	5 54
58	18 08	20 23	5 06	5 26	5 37	5 43
56	18 08	20 15	4 41	5 07	5 23	5 33
54	18 08	20 09	4 22	4 51	5 11	5 24
52	18 08	20 03	4 05	4 37	5 00	5 17
50	18 09	19 58	3 51	4 25	4 50	5 10
45	18 09	19 48	3 21	3 59	4 30	4 55
40	18 09	19 40	2 58	3 39	4 13	4 42
35	18 10	19 34	2 40	3 22	3 59	4 32
30	18 10	19 30	2 23	3 08	3 47	4 22
20	18 10	19 23	1 56	2 43	3 26	4 06
10	18 11	19 21	1 32	2 21	3 08	3 52
0	18 12	19 21	1 09	2 01	2 50	3 38
10	18 12	19 22	0 47	1 40	2 33	3 25
20	18 13	19 26	0 23	1 18	2 14	3 10
30	18 15	19 35	24 53	0 53	1 52	2 53
35	18 15	19 40	24 38	0 38	1 40	2 43
40	18 16	19 47	24 20	0 20	1 25	2 32
45	18 17	19 56	23 59	25 07	1 07	2 18
50	18 18	20 08	23 32	24 45	0 45	2 02
52	18 19	20 15	23 18	24 35	0 35	1 54
54	18 20	20 22	23 03	24 23	0 23	1 45
56	18 20	20 29	22 45	24 09	0 09	1 36
58	18 21	20 39	22 23	23 53	25 24	1 24
60	18 22	20 50	21 55	23 33	25 11	1 11
S						

GCT	Equation of Time (App.—Mean) 17	18	19
h	m s	m s	m s
0	− 8 46.3	− 8 29.0	− 8 11.5
6	− 8 42.0	− 8 24.7	− 8 07.1
12	− 8 37.7	− 8 20.3	− 8 02.7
18	− 8 33.4	− 8 15.9	− 7 58.3
24	− 8 29.0	− 8 11.5	− 7 53.8

GCT of Transit Meridian of Greenwich

DAY	Moon	Venus	Mars	Jupiter	Saturn
	h m	h m	h m	h m	h m
17	19 48	13 57	13 08	11 54	0 26
18	20 38	13 58	13 07	11 51	0 22
19	21 27	13 58	13 06	11 48	0 18
20	22 13	13 59	13 04	11 45	0 14

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb	Venus	Mars
°	′	′	′
0	0.4	0.1	0.1
30	0.4	0.1	0.0
45	0.4	0.1	0.0
60	0.4	0.0	0.0
75	0.4	0.0	0.0
90			

Moon's Lower Limb *Add*

Alt.	17	18	19
°	′	′	′
0	12.6	13.1	13.9
4	12.6	13.1	13.9
8	12.7	13.2	13.9
12	12.7	13.2	13.9
16	12.7	13.2	14.0
20	12.8	13.3	14.0
24	12.9	13.3	14.0
28	12.9	13.4	14.1
32	13.0	13.5	14.1
36	13.1	13.5	14.2
40	13.2	13.6	14.2
44	13.3	13.7	14.3
48	13.4	13.8	14.4
52	13.6	13.9	14.4
56	13.7	14.0	14.5
60	13.8	14.1	14.6
64	14.0	14.3	14.7
68	14.1	14.4	14.8
72	14.3	14.5	14.8
76	14.4	14.6	14.9
80	14.6	14.8	15.0
84	14.8	14.9	15.1
88	14.9	15.0	15.2
90			

Add to table, back cover

Moon's Upper Limb *Subtract*

Alt.	17	18	19
°	′	′	′
0	17.2	16.9	16.5
4	17.2	16.9	16.5
8	17.2	16.9	16.5
12	17.2	16.9	16.5
16	17.1	16.8	16.4
20	17.1	16.8	16.4
24	17.0	16.7	16.4
28	16.9	16.7	16.3
32	16.8	16.6	16.3
36	16.7	16.5	16.2
40	16.6	16.4	16.2
44	16.5	16.4	16.1
48	16.4	16.3	16.0
52	16.3	16.2	16.0
56	16.1	16.0	15.9
60	16.0	15.9	15.8
64	15.9	15.8	15.7
68	15.7	15.7	15.6
72	15.6	15.6	15.6
76	15.4	15.4	15.5
80	15.2	15.3	15.4
84	15.1	15.2	15.3
88	15.0	15.1	15.2
90			

Subtract from table, back cover

Palm Sunday 18

GCT	♈	VENUS −3.4		MARS 1.5		JUPITER −1.6		SATURN 0.7		MOON			
	GHA	GHA	Dec.	GHA	Dec.	GHA	Dec.	GHA	Dec.	GHA	code	Dec.	code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
0	176 43.1	150 24.3	+10 43.6	163 45.8	+ 5 02.9	183 20.9	− 3 59.4	356 35.9	+ 2 42.7	37 05.4	124	+18 41.7	−120
1	191 45.6	165 23.9	44.8	178 46.6	03.7	198 22.8	59.1	11 38.5	42.8	51 36.8	125	18 29.7	−121
2	206 48.0	180 23.5	46.0	193 47.3	04.4	213 24.7	58.9	26 41.2	42.9	66 08.3	125	18 17.6	−122
3	221 50.5	195 23.1	·· 47.2	208 48.0	·· 05.2	228 26.6	·· 58.7	41 43.8	·· 43.0	80 39.8	126	·18 05.4	−123
4	236 53.0	210 22.7	48.4	223 48.7	05.9	243 28.5	58.4	56 46.5	43.0	95 11.4	125	17 53.1	−123
5	251 55.4	225 22.3	49.6	238 49.4	06.7	258 30.4	58.2	71 49.1	43.1	109 42.9	126	17 40.8	−125
6	266 57.9	240 22.0	+10 50.8	253 50.1	+ 5 07.5	273 32.3	− 3 58.0	86 51.7	+ 2 43.2	124 14.5	127	+17 28.3	−126
7	282 00.3	255 21.6	52.0	268 50.8	08.2	288 34.2	57.7	101 54.4	43.3	138 46.2	127	17 15.7	−127
8	297 02.8	270 21.2	53.2	283 51.6	09.0	303 36.1	57.5	116 57.0	43.4	153 17.9	127	17 03.0	−127
9	312 05.3	285 20.8	·· 54.4	298 52.3	·· 09.8	318 38.1	·· 57.2	131 59.7	·· 43.4	167 49.6	128	·16 50.3	−129
10	327 07.7	300 20.4	55.6	313 53.0	10.5	333 40.0	57.0	147 02.3	43.5	182 21.4	127	16 37.4	−129
11	342 10.2	315 20.0	56.8	328 53.7	11.3	348 41.9	56.8	162 05.0	43.6	196 53.1	129	16 24.5	−130
12	357 12.7	330 19.6	+10 57.9	343 54.4	+ 5 12.0	3 43.8	− 3 56.5	177 07.6	+ 2 43.7	211 25.0	128	+16 11.5	−131
13	12 15.1	345 19.2	10 59.1	358 55.1	12.8	18 45.7	56.3	192 10.3	43.8	225 56.8	129	15 58.4	−132
14	27 17.6	0 18.8	11 00.3	13 55.8	13.6	33 47.6	56.1	207 12.9	43.8	240 28.7	129	15 45.2	−133
15	42 20.1	15 18.4	·· 01.5	28 56.5	·· 14.3	48 49.5	·· 55.8	222 15.5	·· 43.9	255 00.6	130	·15 31.9	−134
16	57 22.5	30 18.1	02.7	43 57.3	15.1	63 51.4	55.6	237 18.2	44.0	269 32.6	130	15 18.5	−134
17	72 25.0	45 17.7	03.9	58 58.0	15.8	78 53.3	55.3	252 20.8	44.1	284 04.6	130	15 05.1	−136
18	87 27.4	60 17.3	+11 05.1	73 58.7	+ 5 16.6	93 55.2	− 3 55.1	267 23.5	+ 2 44.2	298 36.6	130	+14 51.5	−136
19	102 29.9	75 16.9	06.3	88 59.4	17.4	108 57.1	54.9	282 26.1	44.2	313 08.6	131	14 37.9	−137
20	117 32.4	90 16.5	07.5	104 00.1	18.1	123 59.0	54.6	297 28.8	44.3	327 40.7	131	14 24.2	−137
21	132 34.8	105 16.1	·· 08.7	119 00.8	·· 18.9	139 00.9	·· 54.4	312 31.4	·· 44.4	342 12.8	131	·14 10.5	−139
22	147 37.3	120 15.7	09.9	134 01.5	19.6	154 02.9	54.2	327 34.1	44.5	356 44.9	132	13 56.6	−139
23	162 39.8	135 15.3	11.1	149 02.3	20.4	169 04.8	53.9	342 36.7	44.6	11 17.1	132	13 42.7	−140
0	177 42.2	150 14.9	+11 12.3	164 03.0	+ 5 21.2	184 06.7	− 3 53.7	357 39.3	+ 2 44.6	25 49.3	132	+13 28.7	−141
1	192 44.7	165 14.5	13.4	179 03.7	21.9	199 08.6	53.5	12 42.0	44.7	40 21.5	132	13 14.6	−142
2	207 47.2	180 14.1	14.6	194 04.4	22.7	214 10.5	53.2	27 44.6	44.8	54 53.7	132	13 00.4	−142
3	222 49.6	195 13.7	·· 15.8	209 05.1	·· 23.4	229 12.4	·· 53.0	42 47.3	·· 44.9	69 25.9	133	·12 46.2	−144
4	237 52.1	210 13.3	17.0	224 05.8	24.2	244 14.3	52.7	57 49.9	45.0	83 58.2	133	12 31.8	−143
5	252 54.6	225 12.9	18.2	239 06.5	25.0	259 16.2	52.5	72 52.6	45.0	98 30.5	133	12 17.5	−145
6	267 57.0	240 12.6	+11 19.4	254 07.3	+ 5 25.7	274 18.1	− 3 52.3	87 55.2	+ 2 45.1	113 02.8	134	+12 03.0	−145
7	282 59.5	255 12.2	20.6	269 08.0	26.5	289 20.0	52.0	102 57.9	45.2	127 35.2	133	11 48.5	−146
8	298 01.9	270 11.8	21.8	284 08.7	27.2	304 21.9	51.8	118 00.5	45.3	142 07.5	134	11 33.9	−147
9	313 04.4	285 11.4	·· 22.9	299 09.4	·· 28.0	319 23.8	·· 51.6	133 03.1	·· 45.4	156 39.9	134	·11 19.2	−147
10	328 06.9	300 11.0	24.1	314 10.1	28.8	334 25.8	51.3	148 05.8	45.4	171 12.3	134	11 04.5	−148
11	343 09.3	315 10.6	25.3	329 10.8	29.5	349 27.7	51.1	163 08.4	45.5	185 44.7	134	10 49.7	−149
12	358 11.8	330 10.2	+11 26.5	344 11.5	+ 5 30.3	4 29.6	− 3 50.8	178 11.1	+ 2 45.6	200 17.1	134	+10 34.8	−149
13	13 14.3	345 09.8	27.7	359 12.2	31.0	19 31.5	50.6	193 13.7	45.7	214 49.5	135	10 19.9	−150
14	28 16.7	0 09.4	28.9	14 13.0	31.8	34 33.4	50.4	208 16.4	45.8	229 22.0	135	10 04.9	−150
15	43 19.2	15 09.0	·· 30.0	29 13.7	·· 32.6	49 35.3	·· 50.1	223 19.0	·· 45.8	243 54.5	134	· 9 49.9	−151
16	58 21.7	30 08.6	31.2	44 14.4	33.3	64 37.2	49.9	238 21.7	45.9	258 26.9	135	9 34.8	−152
17	73 24.1	45 08.2	32.4	59 15.1	34.1	79 39.1	49.7	253 24.3	46.0	272 59.4	135	9 19.6	−152
18	88 26.6	60 07.8	+11 33.6	74 15.8	+ 5 34.8	94 41.0	− 3 49.4	268 26.9	+ 2 46.1	287 31.9	135	+ 9 04.4	−153
19	103 29.0	75 07.4	34.8	89 16.5	35.6	109 42.9	49.2	283 29.6	46.2	302 04.4	135	8 49.1	−154
20	118 31.5	90 07.0	36.0	104 17.2	36.4	124 44.8	49.0	298 32.2	46.2	316 36.9	136	8 33.7	−154
21	133 34.0	105 06.6	·· 37.1	119 18.0	·· 37.1	139 46.7	·· 48.7	313 34.9	·· 46.3	331 09.5	135	· 8 18.3	−154
22	148 36.4	120 06.2	38.3	134 18.7	37.9	154 48.7	48.5	328 37.5	46.4	345 42.0	135	8 02.9	−155
23	163 38.9	135 05.8	39.5	149 19.4	38.6	169 50.6	48.2	343 40.2	46.5	0 14.5	136	7 47.4	−156
0	178 41.4	150 05.4	+11 40.7	164 20.1	+ 5 39.4	184 52.5	− 3 48.0	358 42.8	+ 2 46.6	14 47.1	135	+ 7 31.8	−156
1	193 43.8	165 05.0	41.9	179 20.8	40.1	199 54.4	47.8	13 45.4	46.6	29 19.6	136	7 16.2	−156
2	208 46.3	180 04.6	43.0	194 21.5	40.9	214 56.3	47.5	28 48.1	46.7	43 52.2	135	7 00.6	−157
3	223 48.8	195 04.2	·· 44.2	209 22.2	·· 41.7	229 58.2	·· 47.3	43 50.7	·· 46.8	58 24.7	136	· 6 44.9	−158
4	238 51.2	210 03.8	45.4	224 22.9	42.4	245 00.1	47.1	58 53.4	46.9	72 57.3	135	6 29.1	−158
5	253 53.7	225 03.4	46.6	239 23.7	43.2	260 02.0	46.8	73 56.0	47.0	87 29.8	136	6 13.3	−158
6	268 56.2	240 03.0	+11 47.7	254 24.4	+ 5 43.9	275 03.9	− 3 46.6	88 58.7	+ 2 47.0	102 02.4	135	+ 5 57.5	−159
7	283 58.6	255 02.6	48.9	269 25.1	44.7	290 05.8	46.4	104 01.3	47.1	116 34.9	135	5 41.6	−160
8	299 01.1	270 02.2	50.1	284 25.8	45.4	305 07.7	46.1	119 04.0	47.2	131 07.4	136	5 25.6	−159
9	314 03.5	285 01.8	·· 51.3	299 26.5	·· 46.2	320 09.6	·· 45.9	134 06.6	·· 47.3	145 40.0	135	· 5 09.7	−160
10	329 06.0	300 01.4	52.4	314 27.2	46.9	335 11.6	45.6	149 09.2	47.4	160 12.5	135	4 53.7	−161
11	344 08.5	315 01.0	53.6	329 27.9	47.7	350 13.5	45.4	164 11.9	47.4	174 45.0	135	4 37.6	−161
12	359 10.9	330 00.6	+11 54.8	344 28.7	+ 5 48.5	5 15.4	− 3 45.2	179 14.5	+ 2 47.5	189 17.5	135	+ 4 21.5	−161
13	14 13.4	345 00.2	56.0	359 29.4	49.2	20 17.3	44.9	194 17.2	47.6	203 50.0	135	4 05.4	−161
14	29 15.9	359 59.8	57.1	14 30.1	50.0	35 19.2	44.7	209 19.8	47.7	218 22.5	135	3 49.3	−162
15	44 18.3	14 59.4	·· 58.3	29 30.8	·· 50.7	50 21.1	·· 44.5	224 22.5	·· 47.7	232 55.0	135	· 3 33.1	−163
16	59 20.8	29 59.0	11 59.5	44 31.5	51.5	65 23.0	44.2	239 25.1	47.8	247 27.5	134	3 16.8	−162
17	74 23.3	44 58.5	12 00.6	59 32.2	52.2	80 24.9	44.0	254 27.8	47.9	261 59.9	135	3 00.6	−163
18	89 25.7	59 58.1	+12 01.8	74 32.9	+ 5 53.0	95 26.8	− 3 43.8	269 30.4	+ 2 48.0	276 32.4	134	+ 2 44.3	−163
19	104 28.2	74 57.7	03.0	89 33.6	53.7	110 28.7	43.5	284 33.0	48.1	291 04.8	134	2 28.0	−163
20	119 30.7	89 57.3	04.1	104 34.4	54.5	125 30.6	43.3	299 35.7	48.1	305 37.2	134	2 11.7	−164
21	134 33.1	104 56.9	·· 05.3	119 35.1	·· 55.3	140 32.6	·· 43.0	314 38.3	·· 48.2	320 09.6	134	· 1 55.3	−164
22	149 35.6	119 56.5	06.5	134 35.8	56.0	155 34.5	42.8	329 41.0	48.3	334 42.0	133	1 38.9	−164
23	164 38.0	134 56.1	07.6	149 36.5	56.8	170 36.4	42.6	344 43.6	48.4	349 14.3	134	1 22.5	−164
24	179 40.5	149 55.7	+12 08.8	164 37.2	+ 5 57.5	185 38.3	− 3 42.3	359 46.3	+ 2 48.5	3 46.7	133	+ 1 06.1	−165
code	—	− 4	+ 12	+ 7	+ 7	+ 19	+ 2	+ 26	+ 1				

GCT	SUN GHA	SUN Dec.
h	° ′	° ′
0	178 01.6	− 0 34.0
1	193 01.8	33.0
2	208 02.0	32.0
3	223 02.2 ••	31.1
4	238 02.4	30.1
5	253 02.6	29.1
6	268 02.7	− 0 28.1
7	283 02.9	27.1
8	298 03.1	26.1
9	313 03.3 ••	25.1
10	328 03.5	24.1
11	343 03.7	23.2
12	358 03.9	− 0 22.2
13	13 04.0	21.2
14	28 04.2	20.2
15	43 04.4 ••	19.2
16	58 04.6	18.2
17	73 04.8	17.2
18	88 05.0	− 0 16.2
19	103 05.2	15.2
20	118 05.3	14.3
21	133 05.5 ••	13.3
22	148 05.7	12.3
23	163 05.9	11.3
0	178 06.1	− 0 10.3
1	193 06.3	09.3
2	208 06.5	08.3
3	223 06.7 ••	07.3
4	238 06.8	06.4
5	253 07.0	05.4
6	268 07.2	− 0 04.4
7	283 07.4	03.4
8	298 07.6	02.4
9	313 07.8 ••	01.4
10	328 08.0	− 0 00.4
11	343 08.1	+ 0 00.6
12	358 08.3	+ 0 01.5
13	13 08.5	02.5
14	28 08.7	03.5
15	43 08.9 ••	04.5
16	58 09.1	05.5
17	73 09.3	06.5
18	88 09.5	+ 0 07.5
19	103 09.6	08.5
20	118 09.8	09.4
21	133 10.0 ••	10.4
22	148 10.2	11.4
23	163 10.4	12.4
0	178 10.6	+ 0 13.4
1	193 10.8	14.4
2	208 11.0	15.4
3	223 11.2 ••	16.3
4	238 11.3	17.3
5	253 11.5	18.3
6	268 11.7	+ 0 19.3
7	283 11.9	20.3
8	298 12.1	21.3
9	313 12.3 ••	22.3
10	328 12.5	23.3
11	343 12.7	24.2
12	358 12.8	+ 0 25.2
13	13 13.0	26.2
14	28 13.2	27.2
15	43 13.4 ••	28.2
16	58 13.6	29.2
17	73 13.8	30.2
18	88 14.0	+ 0 31.2
19	103 14.2	32.1
20	118 14.4	33.1
21	133 14.5 ••	34.1
22	148 14.7	35.1
23	163 14.9	36.1
24	178 15.1	+ 0 37.1
code	—	+ 10

STARS No.	SHA	Dec.	Transit Mer. Gr.
	° ′	° ′	h m
1	358 32.5	+28 49.2	12 13
2	358 22.4	+58 52.8	12 14
3	349 43.1	−18 15.3	12 48
4	339 21.7	+59 59.1	13 30
5	336 01.8	−57 29.1	13 43
6	333 00.1	+89 02.3	13 55
7	328 54.0	+23 14.0	14 11
8	315 54.0	−40 30.1	15 03
9	309 47.9	+49 41.6	15 27
10	291 43.3	+16 24.9	16 40
11	281 57.1	− 8 15.4	17 19
12	281 43.8	+45 57.3	17 19
13	279 22.3	+ 6 18.5	17 29
14	279 11.9	+28 34.3	17 30
15	276 33.9	− 1 13.9	17 40
16	271 52.0	+ 7 24.0	17 59
17	264 16.9	−52 40.3	18 29
18	259 14.9	−16 38.9	18 49
19	255 49.3	−28 54.4	19 03
20	245 48.6	+ 5 21.1	19 43
21	244 24.8	+28 08.9	19 48
22	234 37.1	−59 21.3	20 27
23	223 26.8	−43 14.2	21 12
24	221 49.5	−69 31.1	21 18
25	218 41.9	− 8 26.9	21 31
26	208 33.0	+12 12.3	22 11
27	194 48.0	+62 00.9	23 06
28	183 21.0	+14 50.5	23 52
29	174 01.5	−62 49.8	0 33
30	172 52.9	−56 50.5	0 38
31	168 46.8	−59 25.4	0 54
32	167 00.9	+56 13.3	1 01
33	159 29.8	+55 10.5	1 31
34	159 20.4	−10 54.6	1 32
35	153 35.1	+49 33.1	1 55
36	149 02.7	−36 08.0	2 13
37	146 38.1	+19 25.8	2 22
38	140 55.6	−60 38.2	2 45
39	137 16.4	+74 20.9	3 00
40	126 50.4	+26 52.3	3 41
41	120 38.1	−22 29.2	4 06
42	113 23.6	−26 19.7	4 35
43	109 07.5	−68 56.4	4 52
44	103 06.2	−15 40.2	5 16
45	97 25.5	−37 04.3	5 39
46	96 49.9	+12 35.3	5 41
47	91 07.9	+51 29.2	6 04
48	84 45.9	−34 24.7	6 29
49	81 10.8	+38 43.8	6 43
50	76 56.4	−26 21.7	7 00
51	62 54.1	+ 8 44.0	7 56
52	54 33.1	−56 53.6	8 30
53	50 03.8	+45 05.9	8 47
54	34 33.4	+ 9 38.8	9 49
55	28 42.7	−47 11.9	10 13
56	16 15.8	−29 53.0	11 02
57	14 25.4	+14 56.4	11 10

Lat.	Sunrise	Twlt. begins	Moonrise 20	21	22	23
N °	h m	h m	h m	h m	h m	h m
70	5 58	1 55	12 28	14 52	17 00	19 09
68	5 59	2 30	12 57	15 05	17 04	19 03
66	5 59	2 54	13 19	15 15	17 07	18 59
64	6 00	3 12	13 36	15 24	17 09	18 55
62	6 01	3 26	13 51	15 32	17 11	18 52
60	6 01	3 38	14 02	15 38	17 13	18 50
58	6 01	3 48	14 13	15 44	17 15	18 47
56	6 02	3 56	14 22	15 49	17 16	18 45
54	6 02	4 03	14 29	15 53	17 17	18 43
52	6 02	4 09	14 36	15 57	17 18	18 42
50	6 02	4 15	14 43	16 01	17 20	18 40
45	6 03	4 26	14 56	16 09	17 22	18 37
40	6 03	4 34	15 07	16 15	17 24	18 34
35	6 03	4 40	15 16	16 21	17 25	18 31
30	6 04	4 45	15 25	16 26	17 27	18 29
20	6 04	4 52	15 39	16 34	17 29	18 26
10	6 04	4 55	15 51	16 41	17 32	18 23
0	6 04	4 55	16 02	16 48	17 34	18 20
10	6 04	4 54	16 14	16 55	17 36	18 17
20	6 04	4 51	16 26	17 02	17 38	18 14
30	6 04	4 43	16 40	17 11	17 40	18 10
35	6 03	4 38	16 48	17 15	17 42	18 09
40	6 03	4 31	16 57	17 21	17 43	18 06
45	6 03	4 22	17 07	17 27	17 45	18 04
50	6 02	4 11	17 20	17 34	17 48	18 01
52	6 02	4 05	17 26	17 38	17 49	18 00
54	6 02	3 59	17 32	17 42	17 50	17 58
56	6 02	3 51	17 39	17 46	17 51	17 57
58	6 01	3 43	17 47	17 50	17 53	17 55
60	6 01	3 32	17 56	17 55	17 54	17 53
S						

Lat.	Sunset	Twlt. ends	Moonset 20	21	22	23
N °	h m	h m	h m	h m	h m	h m
70	18 19	22 33	7 35	6 48	6 17	5 49
68	18 18	21 54	7 04	6 33	6 10	5 49
66	18 17	21 28	6 41	6 21	6 05	5 50
64	18 16	21 09	6 22	6 10	6 00	5 50
62	18 16	20 55	6 07	6 01	5 56	5 51
60	18 15	20 42	5 54	5 54	5 52	5 51
58	18 15	20 32	5 43	5 47	5 49	5 51
56	18 14	20 23	5 33	5 41	5 46	5 52
54	18 14	20 16	5 24	5 35	5 44	5 52
52	18 14	20 09	5 17	5 30	5 42	5 52
50	18 13	20 03	5 10	5 26	5 39	5 52
45	18 13	19 52	4 55	5 16	5 35	5 53
40	18 12	19 43	4 42	5 08	5 31	5 53
35	18 12	19 37	4 32	5 00	5 27	5 54
30	18 12	19 32	4 22	4 54	5 24	5 54
20	18 11	19 24	4 06	4 43	5 19	5 54
10	18 11	19 21	3 52	4 34	5 14	5 55
0	18 11	19 20	3 38	4 24	5 10	5 55
10	18 11	19 21	3 25	4 15	5 05	5 56
20	18 11	19 24	3 10	4 05	5 00	5 56
30	18 11	19 31	2 53	3 54	4 55	5 56
35	18 11	19 36	2 43	3 47	4 52	5 57
40	18 11	19 42	2 32	3 40	4 48	5 57
45	18 11	19 50	2 18	3 31	4 43	5 57
50	18 12	20 02	2 02	3 20	4 38	5 58
52	18 12	20 07	1 54	3 15	4 36	5 58
54	18 12	20 13	1 45	3 09	4 33	5 58
56	18 12	20 20	1 36	3 03	4 30	5 58
58	18 12	20 28	1 24	2 56	4 27	5 58
60	18 13	20 38	1 11	2 48	4 23	5 58
S						

GCT	Equation of Time (App.—Mean) 20	21	22
h	m s	m s	m s
0	− 7 53.8	− 7 36.0	− 7 18.0
6	− 7 49.4	− 7 31.5	− 7 13.5
12	− 7 44.9	− 7 27.0	− 7 09.0
18	− 7 40.5	− 7 22.5	− 7 04.5
24	− 7 36.0	− 7 18.0	− 6 59.9

GCT of Transit Meridian of Greenwich

DAY	Moon	Venus	Mars	Jupiter	Saturn
	h m	h m	h m	h m	h m
20	22 13	13 59	13 04	11 45	0 14
21	22 59	13 59	13 03	11 42	0 09
22	23 44	14 00	13 02	11 39	0 05
23	24 31	14 01	13 01	11 36	{0 01 / 23 57}

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb	Venus	Mars
°	′	′	′
0			
30	0.4	0.1	0.1
45	0.4	0.1	0.0
60	0.4	0.1	0.0
75	0.4	0.0	0.0
90	0.4	0.0	0.0

Moon's Lower Limb
Add

Alt.	20	21	22
°	′	′	′
0	14.8	15.7	16.6
4	14.8	15.7	16.6
8	14.8	15.7	16.6
12	14.8	15.7	16.5
16	14.8	15.7	16.5
20	14.8	15.7	16.5
24	14.8	15.7	16.5
28	14.9	15.7	16.5
32	14.9	15.7	16.4
36	14.9	15.7	16.4
40	14.9	15.7	16.4
44	15.0	15.6	16.3
48	15.0	15.6	16.3
52	15.0	15.6	16.2
56	15.1	15.6	16.2
60	15.1	15.6	16.1
64	15.1	15.6	16.1
68	15.2	15.6	16.0
72	15.2	15.6	16.0
76	15.3	15.6	15.9
80	15.3	15.6	15.9
84	15.3	15.6	15.8
88	15.4	15.6	15.8
90			

Add to table, back cover

Moon's Upper Limb
Subtract

Alt.	20	21	22
°	′	′	′
0	16.0	15.5	15.0
4	16.0	15.5	15.0
8	16.0	15.5	15.0
12	16.0	15.5	15.0
16	16.0	15.5	15.0
20	15.9	15.5	15.0
24	15.9	15.5	15.0
28	15.9	15.5	15.1
32	15.9	15.5	15.1
36	15.9	15.5	15.1
40	15.8	15.5	15.2
44	15.8	15.5	15.2
48	15.8	15.5	15.3
52	15.7	15.5	15.3
56	15.7	15.5	15.3
60	15.7	15.5	15.4
64	15.6	15.5	15.4
68	15.6	15.5	15.5
72	15.6	15.6	15.5
76	15.5	15.6	15.6
80	15.5	15.6	15.7
84	15.4	15.6	15.7
88	15.4	15.6	15.8
90			

Subtract from table, back cover

GCT	♈ GHA	VENUS −3.4 GHA	VENUS Dec.	MARS 1.5 GHA	MARS Dec.	JUPITER −1.6 GHA	JUPITER Dec.	SATURN 0.7 GHA	SATURN Dec.	MOON GHA	code	MOON Dec.	code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
0	179 40.5	149 55.7	+12 08.8	164 37.2	+ 5 57.5	185 38.3	− 3 42.3	359 46.3	+ 2 48.5	3 46.7	133	+ 1 06.1	−165
1	194 43.0	164 55.3	10.0	179 37.9	58.3	200 40.2	42.1	14 48.9	48.5	18 19.0	133	0 49.6	−165
2	209 45.4	179 54.9	11.1	194 38.6	59.0	215 42.1	41.9	29 51.6	48.6	32 51.3	132	0 33.1	−165
3	224 47.9	194 54.5	·· 12.3	209 39.4	· 5 59.8	230 44.0	·· 41.6	44 54.2	·· 48.7	47 23.5	132	· 0 16.6	−165
4	239 50.4	209 54.1	13.5	224 40.1	6 00.5	245 45.9	41.4	59 56.8	48.8	61 55.7	132	+ 0 00.1	−165
5	254 52.8	224 53.7	14.6	239 40.8	01.3	260 47.8	41.2	74 59.5	48.9	76 27.9	132	− 0 16.4	−165
6	269 55.3	239 53.3	+12 15.8	254 41.5	+ 6 02.0	275 49.7	− 3 40.9	90 02.1	+ 2 48.9	91 00.1	132	− 0 32.9	−166
7	284 57.8	254 52.8	17.0	269 42.2	02.8	290 51.6	40.7	105 04.8	49.0	105 32.3	131	0 49.5	−165
8	300 00.2	269 52.4	18.1	284 42.9	03.6	305 53.6	40.5	120 07.4	49.1	120 04.4	131	1 06.0	−166
9	315 02.7	284 52.0	·· 19.3	299 43.6	·· 04.3	320 55.5	·· 40.2	135 10.1	·· 49.2	134 36.5	130	· 1 22.6	−166
10	330 05.1	299 51.6	20.5	314 44.3	05.1	335 57.4	40.0	150 12.7	49.3	149 08.5	130	1 39.2	−166
11	345 07.6	314 51.2	21.6	329 45.1	05.8	350 59.3	39.7	165 15.4	49.3	163 40.5	130	1 55.8	−166
12	0 10.1	329 50.8	+12 22.8	344 45.8	+ 6 06.6	6 01.2	− 3 39.5	180 18.0	+ 2 49.4	178 12.5	129	− 2 12.4	−165
13	15 12.5	344 50.4	23.9	359 46.5	07.3	21 03.1	39.3	195 20.6	49.5	192 44.4	129	2 28.9	−166
14	30 15.0	359 50.0	25.1	14 47.2	08.1	36 05.0	39.0	210 23.3	49.6	207 16.3	129	2 45.5	−166
15	45 17.5	14 49.6	·· 26.3	29 47.9	·· 08.8	51 06.9	·· 38.8	225 25.9	·· 49.7	221 48.2	128	· 3 02.1	−166
16	60 19.9	29 49.1	27.4	44 48.6	09.6	66 08.8	38.6	240 28.6	49.7	236 20.0	128	3 18.7	−166
17	75 22.4	44 48.7	28.6	59 49.3	10.3	81 10.7	38.3	255 31.2	49.8	250 51.8	127	3 35.3	−166
18	90 24.9	59 48.3	+12 29.7	74 50.0	+ 6 11.1	96 12.7	− 3 38.1	270 33.9	+ 2 49.9	265 23.5	127	− 3 51.9	−166
19	105 27.3	74 47.9	30.9	89 50.8	11.8	111 14.6	37.9	285 36.5	50.0	279 55.2	127	4 08.5	−165
20	120 29.8	89 47.5	32.1	104 51.5	12.6	126 16.5	37.6	300 39.1	50.1	294 26.9	126	4 25.0	−166
21	135 32.3	104 47.1	·· 33.2	119 52.2	·· 13.3	141 18.4	·· 37.4	315 41.8	·· 50.1	308 58.5	125	· 4 41.6	−166
22	150 34.7	119 46.7	34.4	134 52.9	14.1	156 20.3	37.1	330 44.4	50.2	323 30.0	125	4 58.2	−165
23	165 37.2	134 46.2	35.5	149 53.6	14.8	171 22.2	36.9	345 47.1	50.3	338 01.5	125	5 14.7	−165
0	180 39.6	149 45.8	+12 36.7	164 54.3	+ 6 15.6	186 24.1	− 3 36.7	0 49.7	+ 2 50.4	352 33.0	124	− 5 31.2	−166
1	195 42.1	164 45.4	37.8	179 55.0	16.3	201 26.0	36.4	15 52.4	50.4	7 04.4	123	5 47.8	−165
2	210 44.6	179 45.0	39.0	194 55.8	17.1	216 27.9	36.2	30 55.0	50.5	21 35.7	123	6 04.3	−164
3	225 47.0	194 44.6	·· 40.1	209 56.5	·· 17.8	231 29.8	·· 36.0	45 57.7	·· 50.6	36 07.0	122	· 6 20.7	−165
4	240 49.5	209 44.2	41.3	224 57.2	18.6	246 31.7	35.7	61 00.3	50.7	50 38.2	122	6 37.2	−164
5	255 52.0	224 43.8	42.4	239 57.9	19.3	261 33.7	35.5	76 02.9	50.8	65 09.4	122	6 53.6	−164
6	270 54.4	239 43.3	+12 43.6	254 58.6	+ 6 20.1	276 35.6	− 3 35.3	91 05.6	+ 2 50.8	79 40.6	120	− 7 10.0	−164
7	285 56.9	254 42.9	44.7	269 59.3	20.8	291 37.5	35.0	106 08.2	50.9	94 11.6	120	7 26.4	−164
8	300 59.4	269 42.5	45.9	285 00.0	21.6	306 39.4	34.8	121 10.9	51.0	108 42.6	120	7 42.8	−163
9	316 01.8	284 42.1	·· 47.1	300 00.7	·· 22.3	321 41.3	·· 34.6	136 13.5	·· 51.1	123 13.6	119	· 7 59.1	−163
10	331 04.3	299 41.7	48.2	315 01.5	23.1	336 43.2	34.3	151 16.2	51.2	137 44.5	118	8 15.4	−163
11	346 06.8	314 41.3	49.4	330 02.2	23.8	351 45.1	34.1	166 18.8	51.2	152 15.3	117	8 31.7	−163
12	1 09.2	329 40.8	+12 50.5	345 02.9	+ 6 24.6	6 47.0	− 3 33.8	181 21.4	+ 2 51.3	166 46.0	117	− 8 48.0	−162
13	16 11.7	344 40.4	51.6	0 03.6	25.3	21 48.9	33.6	196 24.1	51.4	181 16.7	116	9 04.2	−162
14	31 14.1	359 40.0	52.8	15 04.3	26.1	36 50.8	33.4	211 26.7	51.5	195 47.3	116	9 20.4	−161
15	46 16.6	14 39.6	·· 53.9	30 05.0	·· 26.8	51 52.8	·· 33.1	226 29.4	·· 51.6	210 17.9	115	· 9 36.5	−161
16	61 19.1	29 39.2	55.1	45 05.7	27.6	66 54.7	32.9	241 32.0	51.6	224 48.4	114	9 52.6	−160
17	76 21.5	44 38.7	56.2	60 06.4	28.3	81 56.6	32.7	256 34.7	51.7	239 18.8	113	10 08.6	−161
18	91 24.0	59 38.3	+12 57.4	75 07.2	+ 6 29.1	96 58.5	− 3 32.4	271 37.3	+ 2 51.8	253 49.1	113	−10 24.7	−159
19	106 26.5	74 37.9	58.5	90 07.9	29.8	112 00.4	32.2	286 40.0	51.9	268 19.4	112	10 40.6	−159
20	121 28.9	89 37.5	12 59.7	105 08.6	30.6	127 02.3	32.0	301 42.6	51.9	282 49.6	111	10 56.5	−159
21	136 31.4	104 37.1	·13 00.8	120 09.3	·· 31.3	142 04.2	·· 31.7	316 45.2	·· 52.0	297 19.7	111	·11 12.4	−158
22	151 33.9	119 36.6	02.0	135 10.0	32.1	157 06.1	31.5	331 47.9	52.1	311 49.8	109	11 28.2	−158
23	166 36.3	134 36.2	03.1	150 10.7	32.8	172 08.0	31.3	346 50.5	52.2	326 19.7	109	11 44.0	−157
0	181 38.8	149 35.8	+13 04.2	165 11.4	+ 6 33.6	187 10.0	− 3 31.0	1 53.2	+ 2 52.3	340 49.6	108	−11 59.7	−157
1	196 41.2	164 35.4	05.4	180 12.1	34.3	202 11.9	30.8	16 55.8	52.3	355 19.4	108	12 15.4	−156
2	211 43.7	179 34.9	06.5	195 12.9	35.1	217 13.8	30.5	31 58.5	52.4	9 49.2	106	12 31.0	−155
3	226 46.2	194 34.5	·· 07.7	210 13.6	·· 35.8	232 15.7	·· 30.3	47 01.1	·· 52.5	24 18.8	106	·12 46.5	−155
4	241 48.6	209 34.1	08.8	225 14.3	36.6	247 17.6	30.1	62 03.7	52.6	38 48.4	105	13 02.0	−154
5	256 51.1	224 33.7	09.9	240 15.0	37.3	262 19.5	29.8	77 06.4	52.7	53 17.9	104	13 17.4	−154
6	271 53.6	239 33.2	+13 11.1	255 15.7	+ 6 38.1	277 21.4	− 3 29.6	92 09.0	+ 2 52.7	67 47.3	103	−13 32.8	−153
7	286 56.0	254 32.8	12.2	270 16.4	38.8	292 23.3	29.4	107 11.7	52.8	82 16.6	102	13 48.1	−152
8	301 58.5	269 32.4	13.4	285 17.1	39.6	307 25.2	29.1	122 14.3	52.9	96 45.8	102	14 03.3	−152
9	317 01.0	284 32.0	·· 14.5	300 17.8	·· 40.3	322 27.1	·· 28.9	137 17.0	·· 53.0	111 15.0	100	·14 18.5	−150
10	332 03.4	299 31.5	15.6	315 18.6	41.1	337 29.1	28.7	152 19.6	53.0	125 44.0	100	14 33.5	−150
11	347 05.9	314 31.1	16.8	330 19.3	41.8	352 31.0	28.4	167 22.3	53.1	140 13.0	99	14 48.5	−150
12	2 08.4	329 30.7	+13 17.9	345 20.0	+ 6 42.5	7 32.9	− 3 28.2	182 24.9	+ 2 53.2	154 41.9	97	−15 03.5	−148
13	17 10.8	344 30.3	19.0	0 20.7	43.3	22 34.8	28.0	197 27.5	53.3	169 10.6	97	15 18.3	−148
14	32 13.3	359 29.8	20.2	15 21.4	44.0	37 36.7	27.7	212 30.2	53.4	183 39.3	96	15 33.1	−147
15	47 15.7	14 29.4	·· 21.3	30 22.1	·· 44.8	52 38.6	·· 27.5	227 32.8	·· 53.4	198 07.9	95	·15 47.8	−146
16	62 18.2	29 29.0	22.5	45 22.8	45.5	67 40.5	27.2	242 35.5	53.5	212 36.4	95	16 02.4	−145
17	77 20.7	44 28.6	23.6	60 23.5	46.3	82 42.4	27.0	257 38.1	53.6	227 04.9	93	16 16.9	−145
18	92 23.1	59 28.1	+13 24.7	75 24.2	+ 6 47.0	97 44.3	− 3 26.8	272 40.8	+ 2 53.7	241 33.2	92	−16 31.4	−143
19	107 25.6	74 27.7	25.9	90 25.0	47.8	112 46.3	26.5	287 43.4	53.8	256 01.4	91	16 45.7	−143
20	122 28.1	89 27.3	27.0	105 25.7	48.5	127 48.2	26.3	302 46.0	53.8	270 29.5	91	17 00.0	−141
21	137 30.5	104 26.8	·· 28.1	120 26.4	·· 49.3	142 50.1	·· 26.1	317 48.7	·· 53.9	284 57.6	89	·17 14.1	−141
22	152 33.0	119 26.4	29.2	135 27.1	50.0	157 52.0	25.8	332 51.3	54.0	299 25.5	89	17 28.2	−140
23	167 35.5	134 26.0	30.4	150 27.8	50.7	172 53.9	25.6	347 54.0	54.1	313 53.4	87	17 42.2	−139
24	182 37.9	149 25.6	+13 31.5	165 28.5	+ 6 51.5	187 55.8	− 3 25.4	2 56.6	+ 2 54.1	328 21.1	87	−17 56.1	−138
code	—	− 4	+ 11	+ 7	+ 7	+ 19	+ 2	+ 27	+ 1				

GCT	SUN GHA	SUN Dec.
h	° ′	° ′
0	178 15.1	+ 0 37.1
1	193 15.3	38.1
2	208 15.5	39.0
3	223 15.7 ••	40.0
4	238 15.9	41.0
5	253 16.1	42.0
6	268 16.3	+ 0 43.0
7	283 16.4	44.0
8	298 16.6	45.0
9	313 16.8 ••	45.9
10	328 17.0	46.9
11	343 17.2	47.9
12	358 17.4	+ 0 48.9
13	13 17.6	49.9
14	28 17.8	50.9
15	43 18.0 ••	51.9
16	58 18.1	52.8
17	73 18.3	53.8
18	88 18.5	+ 0 54.8
19	103 18.7	55.8
20	118 18.9	56.8
21	133 19.1 ••	57.8
22	148 19.3	58.8
23	163 19.5	0 59.7
0	178 19.7	+ 1 00.7
1	193 19.9	01.7
2	208 20.0	02.7
3	223 20.2 ••	03.7
4	238 20.4	04.7
5	253 20.6	05.7
6	268 20.8	+ 1 06.6
7	283 21.0	07.6
8	298 21.2	08.6
9	313 21.4 ••	09.6
10	328 21.6	10.6
11	343 21.8	11.6
12	358 21.9	+ 1 12.5
13	13 22.1	13.5
14	28 22.3	14.5
15	43 22.5 ••	15.5
16	58 22.7	16.5
17	73 22.9	17.5
18	88 23.1	+ 1 18.5
19	103 23.3	19.4
20	118 23.5	20.4
21	133 23.7 ••	21.4
22	148 23.8	22.4
23	163 24.0	23.4
0	178 24.2	+ 1 24.4
1	193 24.4	25.3
2	208 24.6	26.3
3	223 24.8 ••	27.3
4	238 25.0	28.3
5	253 25.2	29.3
6	268 25.4	+ 1 30.3
7	283 25.6	31.2
8	298 25.8	32.2
9	313 25.9 ••	33.2
10	328 26.1	34.2
11	343 26.3	35.2
12	358 26.5	+ 1 36.2
13	13 26.7	37.1
14	28 26.9	38.1
15	43 27.1 ••	39.1
16	58 27.3	40.1
17	73 27.5	41.1
18	88 27.7	+ 1 42.1
19	103 27.9	43.0
20	118 28.0	44.0
21	133 28.2 ••	45.0
22	148 28.4	46.0
23	163 28.6	47.0
24	178 28.8	+ 1 48.0
code	—	+ 10

STARS No.	SHA	Dec.	Transit Mer. Gr.
	° ′	° ′	h m
1	358 32.5	+28 49.2	12 01
2	358 22.4	+58 52.8	12 02
3	349 43.1	−18 15.3	12 36
4	339 21.7	+59 59.0	13 18
5	336 01.8	−57 29.1	13 31
6	333 00.5	+89 02.3	13 43
7	328 54.0	+23 14.0	13 59
8	315 54.0	−40 30.1	14 51
9	309 48.0	+49 41.6	15 16
10	291 43.3	+16 24.9	16 28
11	281 57.1	− 8 15.4	17 07
12	281 43.9	+45 57.3	17 08
13	279 22.3	+ 6 18.5	17 17
14	279 11.9	+28 34.3	17 18
15	276 34.0	− 1 13.9	17 28
16	271 52.0	+ 7 24.0	17 47
17	264 17.0	−52 40.3	18 17
18	259 15.0	−16 38.9	18 37
19	255 49.3	−28 54.4	18 51
20	245 48.6	+ 5 21.1	19 31
21	244 24.8	+28 08.9	19 36
22	234 37.1	−59 21.3	20 16
23	223 26.8	−43 14.2	21 00
24	221 49.6	−69 31.1	21 07
25	218 41.9	− 8 26.9	21 19
26	208 33.0	+12 12.3	22 00
27	194 48.0	+62 00.9	22 54
28	183 21.0	+14 50.6	23 40
29	174 01.5	−62 49.8	0 21
30	172 52.9	−56 50.5	0 26
31	168 46.8	−59 25.4	0 42
32	167 00.8	+56 13.3	0 49
33	159 29.8	+55 10.5	1 19
34	159 20.4	−10 54.6	1 20
35	153 35.1	+49 33.1	1 43
36	149 02.6	−36 08.0	2 01
37	146 38.1	+19 25.9	2 10
38	140 55.6	−60 38.2	2 33
39	137 16.3	+74 20.9	2 48
40	126 50.4	+26 52.3	3 29
41	120 38.1	−22 29.2	3 54
42	113 23.6	−26 19.7	4 23
43	109 07.5	−68 56.4	4 40
44	103 06.2	−15 40.2	5 04
45	97 25.5	−37 04.3	5 27
46	96 49.9	+12 35.3	5 29
47	91 07.9	+51 29.2	5 52
48	84 45.9	−34 24.7	6 17
49	81 10.7	+38 43.8	6 32
50	76 56.4	−26 21.7	6 48
51	62 54.0	+ 8 44.0	7 44
52	54 33.1	−56 53.6	8 18
53	50 03.8	+45 05.9	8 36
54	34 33.4	+ 9 38.8	9 38
55	28 42.6	−47 11.9	10 01
56	16 15.8	−29 53.0	10 51
57	14 25.4	+14 56.4	10 58

Lat.	Sunrise	Twlt. begins	Moonrise 23	24	25	26
N °	h m	h m	h m	h m	h m	h m
70	5 44	1 20	19 09	21 27	24 25	0 25
68	5 46	2 07	19 03	21 11	23 40	■
66	5 48	2 36	18 59	20 58	23 11	26 14
64	5 49	2 57	18 55	20 47	22 49	25 11
62	5 51	3 13	18 52	20 38	22 32	24 36
60	5 52	3 27	18 50	20 30	22 17	24 11
58	5 53	3 38	18 47	20 24	22 05	23 52
56	5 54	3 46	18 45	20 18	21 55	23 35
54	5 55	3 55	18 43	20 12	21 45	23 21
52	5 55	4 02	18 42	20 08	21 37	23 10
50	5 56	4 07	18 40	20 03	21 30	22 59
45	5 57	4 19	18 37	19 54	21 14	22 37
40	5 58	4 29	18 34	19 46	21 02	22 19
35	5 59	4 36	18 31	19 40	20 51	22 04
30	6 00	4 41	18 29	19 34	20 41	21 51
20	6 01	4 49	18 26	19 24	20 25	21 30
10	6 02	4 53	18 23	19 16	20 12	21 11
0	6 03	4 55	18 20	19 08	19 59	20 54
10	6 04	4 54	18 17	19 00	19 46	20 37
20	6 05	4 52	18 14	18 51	19 32	20 18
30	6 06	4 45	18 10	18 42	19 17	19 57
35	6 06	4 41	18 09	18 37	19 08	19 45
40	6 06	4 35	18 06	18 31	18 58	19 31
45	6 07	4 27	18 04	18 24	18 47	19 15
50	6 07	4 16	18 01	18 15	18 33	18 55
52	6 07	4 12	18 00	18 12	18 26	18 45
54	6 08	4 06	17 58	18 07	18 19	18 35
56	6 08	3 59	17 57	18 03	18 11	18 23
58	6 08	3 51	17 55	17 58	18 02	18 09
60	6 08	3 42	17 53	17 52	17 52	17 53
S						

Lat.	Sunset	Twlt. ends	Moonset 23	24	25	26
N °	h m	h m	h m	h m	h m	h m
70	18 31	23 12	5 49	5 20	4 43	3 34
68	18 29	22 17	5 49	5 28	5 02	4 21
66	18 27	21 45	5 50	5 35	5 17	4 52
64	18 25	21 23	5 50	5 40	5 29	5 15
62	18 24	21 06	5 51	5 45	5 40	5 33
60	18 23	20 52	5 51	5 50	5 49	5 49
58	18 21	20 40	5 51	5 54	5 57	6 02
56	18 21	20 31	5 52	5 57	6 04	6 13
54	18 20	20 23	5 52	6 00	6 10	6 23
52	18 19	20 16	5 52	6 03	6 16	6 32
50	18 18	20 09	5 52	6 06	6 21	6 41
45	18 17	19 57	5 53	6 12	6 33	6 58
40	18 15	19 46	5 53	6 17	6 42	7 12
35	18 14	19 39	5 54	6 21	6 50	7 24
30	18 13	19 33	5 54	6 25	6 57	7 35
20	18 12	19 25	5 54	6 31	7 10	7 53
10	18 11	19 21	5 55	6 37	7 21	8 09
0	18 10	19 19	5 55	6 42	7 31	8 24
10	18 09	19 19	5 56	6 47	7 42	8 39
20	18 08	19 21	5 56	6 53	7 53	8 56
30	18 07	19 27	5 56	7 00	8 06	9 15
35	18 07	19 31	5 57	7 04	8 13	9 26
40	18 06	19 36	5 57	7 08	8 22	9 38
45	18 06	19 44	5 57	7 13	8 32	9 53
50	18 05	19 54	5 58	7 19	8 44	10 12
52	18 05	19 59	5 58	7 22	8 49	10 21
54	18 05	20 05	5 58	7 25	8 56	10 30
56	18 04	20 11	5 58	7 29	9 03	10 42
58	18 04	20 18	5 58	7 32	9 11	10 54
60	18 04	20 27	5 58	7 37	9 20	11 10
S						

GCT	Equation of Time (App.—Mean) 23	24	25
h	m s	m s	m s
0	− 6 59.9	− 6 41.7	− 6 23.5
6	− 6 55.4	− 6 37.2	− 6 18.9
12	− 6 50.8	− 6 32.6	− 6 14.3
18	− 6 46.3	− 6 28.0	− 6 09.7
24	− 6 41.7	− 6 23.5	− 6 05.2

GCT of Transit Meridian of Greenwich

DAY	Moon	Venus	Mars	Jupiter	Saturn
	h m	h m	h m	h m	h m
23	24 31	14 01	13 01	11 36	{0 01 / 23 57}
24	0 31	14 01	13 00	11 33	23 53
25	1 19	14 02	12 59	11 30	23 48
26	2 11	14 03	12 58	11 27	23 44

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb	Venus	Mars
°	′	′	′
0			
	0.4	0.1	0.1
30			
	0.4	0.1	0.0
45			
	0.4	0.1	0.0
60			
	0.4	0.0	0.0
75			
	0.4	0.0	0.0
90			

Moon's Lower Limb
Add

Alt.	23	24	25
°	′	′	′
0			
	17.5	18.1	18.6
4			
	17.5	18.1	18.6
8			
	17.4	18.1	18.6
12			
	17.4	18.0	18.5
16			
	17.4	18.0	18.5
20			
	17.4	18.0	18.4
24			
	17.3	17.9	18.4
28			
	17.3	17.8	18.3
32			
	17.2	17.8	18.2
36			
	17.1	17.7	18.1
40			
	17.1	17.6	18.0
44			
	17.0	17.5	17.9
48			
	16.9	17.4	17.7
52			
	16.8	17.3	17.6
56			
	16.8	17.2	17.5
60			
	16.7	17.0	17.3
64			
	16.6	16.9	17.2
68			
	16.5	16.8	17.0
72			
	16.4	16.6	16.9
76			
	16.3	16.5	16.7
80			
	16.2	16.4	16.5
84			
	16.1	16.2	16.4
88			
	16.0	16.1	16.2
90			

Add to table, back cover

Moon's Upper Limb
Subtract

Alt.	23	24	25
°	′	′	′
0			
	14.5	14.1	13.8
4			
	14.5	14.1	13.8
8			
	14.5	14.1	13.8
12			
	14.5	14.2	13.9
16			
	14.5	14.2	13.9
20			
	14.6	14.2	14.0
24			
	14.6	14.3	14.0
28			
	14.7	14.4	14.1
32			
	14.7	14.4	14.2
36			
	14.8	14.5	14.3
40			
	14.8	14.6	14.4
44			
	14.9	14.7	14.5
48			
	15.0	14.8	14.7
52			
	15.1	14.9	14.8
56			
	15.2	15.0	14.9
60			
	15.3	15.2	15.1
64			
	15.3	15.3	15.2
68			
	15.4	15.4	15.4
72			
	15.5	15.5	15.5
76			
	15.6	15.7	15.7
80			
	15.8	15.8	15.9
84			
	15.9	16.0	16.0
88			
	15.9	16.1	16.2
90			

Subtract from table, back cover

Good Friday	23
Full Moon	23
Easter Sunday	25

GCT	♈ GHA	VENUS −3.4 GHA	VENUS Dec.	MARS 1.5 GHA	MARS Dec.	JUPITER −1.6 GHA	JUPITER Dec.	SATURN 0.8 GHA	SATURN Dec.	MOON GHA	code	MOON Dec.	code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
0	182 37.9	149 25.6	+13 31.5	165 28.5	+ 6 51.5	187 55.8	− 3 25.4	2 56.6	+ 2 54.1	328 21.1	87	−17 56.1	−138
1	197 40.4	164 25.1	32.6	180 29.2	52.2	202 57.7	25.1	17 59.3	54.2	342 48.8	85	18 09.9	−136
2	212 42.8	179 24.7	33.8	195 29.9	53.0	217 59.6	24.9	33 01.9	54.3	357 16.3	84	18 23.5	−136
3	227 45.3	194 24.3	•• 34.9	210 30.7	•• 53.7	233 01.5	•• 24.7	48 04.5	•• 54.4	11 43.7	84	·18 37.1	−135
4	242 47.8	209 23.8	36.0	225 31.4	54.5	248 03.5	24.4	63 07.2	54.5	26 11.1	82	18 50.6	−133
5	257 50.2	224 23.4	37.1	240 32.1	55.2	263 05.4	24.2	78 09.8	54.5	40 38.3	82	19 03.9	−133
6	272 52.7	239 23.0	+13 38.3	255 32.8	+ 6 56.0	278 07.3	− 3 23.9	93 12.5	+ 2 54.6	55 05.5	80	−19 17.2	−131
7	287 55.2	254 22.5	39.4	270 33.5	56.7	293 09.2	23.7	108 15.1	54.7	69 32.5	80	19 30.3	−130
8	302 57.6	269 22.1	40.5	285 34.2	57.4	308 11.1	23.5	123 17.8	54.8	83 59.5	78	19 43.3	−130
9	318 00.1	284 21.7	•• 41.6	300 34.9	•• 58.2	323 13.0	•• 23.2	138 20.4	•• 54.8	98 26.3	78	·19 56.3	−128
10	333 02.6	299 21.2	42.8	315 35.6	58.9	338 14.9	23.0	153 23.0	54.9	112 53.1	76	20 09.1	−126
11	348 05.0	314 20.8	43.9	330 36.4	6 59.7	353 16.8	22.8	168 25.7	55.0	127 19.7	75	20 21.7	−126
12	3 07.5	329 20.4	+13 45.0	345 37.1	+ 7 00.4	8 18.7	− 3 22.5	183 28.3	+ 2 55.1	141 46.2	75	−20 34.3	−124
13	18 10.0	344 19.9	46.1	0 37.8	01.2	23 20.7	22.3	198 31.0	55.2	156 12.7	73	20 46.7	−123
14	33 12.4	359 19.5	47.3	15 38.5	01.9	38 22.6	22.1	213 33.6	55.2	170 39.0	72	20 59.0	−122
15	48 14.9	14 19.1	•• 48.4	30 39.2	•• 02.6	53 24.5	•• 21.8	228 36.3	•• 55.3	185 05.2	72	·21 11.2	−121
16	63 17.3	29 18.6	49.5	45 39.9	03.4	68 26.4	21.6	243 38.9	55.4	199 31.4	70	21 23.3	−119
17	78 19.8	44 18.2	50.6	60 40.6	04.1	83 28.3	21.4	258 41.5	55.5	213 57.4	69	21 35.2	−118
18	93 22.3	59 17.7	+13 51.7	75 41.3	+ 7 04.9	98 30.2	− 3 21.1	273 44.2	+ 2 55.6	228 23.3	68	−21 47.0	−116
19	108 24.7	74 17.3	52.9	90 42.0	05.6	113 32.1	20.9	288 46.8	55.6	242 49.1	68	21 58.6	−115
20	123 27.2	89 16.9	54.0	105 42.8	06.4	128 34.0	20.7	303 49.5	55.7	257 14.9	66	22 10.1	−114
21	138 29.7	104 16.4	•• 55.1	120 43.5	•• 07.1	143 36.0	•• 20.4	318 52.1	•• 55.8	271 40.5	65	·22 21.5	−113
22	153 32.1	119 16.0	56.2	135 44.2	07.8	158 37.9	20.2	333 54.8	55.9	286 06.0	64	22 32.8	−111
23	168 34.6	134 15.6	57.3	150 44.9	08.6	173 39.8	19.9	348 57.4	55.9	300 31.4	63	22 43.9	−109
0	183 37.1	149 15.1	+13 58.4	165 45.6	+ 7 09.3	188 41.7	− 3 19.7	4 00.0	+ 2 56.0	314 56.7	63	−22 54.8	−109
1	198 39.5	164 14.7	13 59.6	180 46.3	10.1	203 43.6	19.5	19 02.7	56.1	329 22.0	61	23 05.7	−106
2	213 42.0	179 14.2	14 00.7	195 47.0	10.8	218 45.5	19.2	34 05.3	56.2	343 47.1	60	23 16.3	−106
3	228 44.4	194 13.8	•• 01.8	210 47.7	•• 11.5	233 47.4	•• 19.0	49 08.0	•• 56.3	358 12.1	59	·23 26.9	−103
4	243 46.9	209 13.4	02.9	225 48.5	12.3	248 49.3	18.8	64 10.6	56.3	12 37.0	59	23 37.2	−103
5	258 49.4	224 12.9	04.0	240 49.2	13.0	263 51.2	18.5	79 13.3	56.4	27 01.9	57	23 47.5	−100
6	273 51.8	239 12.5	+14 05.1	255 49.9	+ 7 13.8	278 53.2	− 3 18.3	94 15.9	+ 2 56.5	41 26.6	56	−23 57.5	− 99
7	288 54.3	254 12.0	06.2	270 50.6	14.5	293 55.1	18.1	109 18.5	56.6	55 51.2	56	24 07.4	− 98
8	303 56.8	269 11.6	07.3	285 51.3	15.2	308 57.0	17.8	124 21.2	56.6	70 15.8	54	24 17.2	− 96
9	318 59.2	284 11.2	•• 08.5	300 52.0	•• 16.0	323 58.9	•• 17.6	139 23.8	•• 56.7	84 40.2	54	·24 26.8	− 94
10	334 01.7	299 10.7	09.6	315 52.7	16.7	339 00.8	17.4	154 26.5	56.8	99 04.6	52	24 36.2	− 93
11	349 04.2	314 10.3	10.7	330 53.4	17.5	354 02.7	17.1	169 29.1	56.9	113 28.8	52	24 45.5	− 91
12	4 06.6	329 09.8	+14 11.8	345 54.1	+ 7 18.2	9 04.6	− 3 16.9	184 31.8	+ 2 57.0	127 53.0	51	−24 54.6	− 90
13	19 09.1	344 09.4	12.9	0 54.9	18.9	24 06.5	16.7	199 34.4	57.0	142 17.1	50	25 03.6	− 88
14	34 11.6	359 08.9	14.0	15 55.6	19.7	39 08.5	16.4	214 37.0	57.1	156 41.1	49	25 12.4	− 86
15	49 14.0	14 08.5	•• 15.1	30 56.3	•• 20.4	54 10.4	•• 16.2	229 39.7	•• 57.2	171 05.0	48	·25 21.0	− 84
16	64 16.5	29 08.1	16.2	45 57.0	21.2	69 12.3	15.9	244 42.3	57.3	185 28.8	47	25 29.4	− 83
17	79 18.9	44 07.6	17.3	60 57.7	21.9	84 14.2	15.7	259 45.0	57.3	199 52.5	47	25 37.7	− 81
18	94 21.4	59 07.2	+14 18.4	75 58.4	+ 7 22.6	99 16.1	− 3 15.5	274 47.6	+ 2 57.4	214 16.2	45	−25 45.8	− 80
19	109 23.9	74 06.7	19.5	90 59.1	23.4	114 18.0	15.2	289 50.3	57.5	228 39.7	45	25 53.8	− 77
20	124 26.3	89 06.3	20.6	105 59.8	24.1	129 19.9	15.0	304 52.9	57.6	243 03.2	44	26 01.5	− 76
21	139 28.8	104 05.8	•• 21.7	121 00.5	•• 24.9	144 21.8	•• 14.8	319 55.5	•• 57.7	257 26.6	44	·26 09.1	− 74
22	154 31.3	119 05.4	22.8	136 01.3	25.6	159 23.8	14.5	334 58.2	57.7	271 50.0	42	26 16.5	− 72
23	169 33.7	134 04.9	23.9	151 02.0	26.3	174 25.7	14.3	350 00.8	57.8	286 13.2	42	26 23.7	− 71
0	184 36.2	149 04.5	+14 25.1	166 02.7	+ 7 27.1	189 27.6	− 3 14.1	5 03.5	+ 2 57.9	300 36.4	41	−26 30.8	− 69
1	199 38.7	164 04.0	26.2	181 03.4	27.8	204 29.5	13.8	20 06.1	58.0	314 59.5	41	26 37.7	− 66
2	214 41.1	179 03.6	27.3	196 04.1	28.5	219 31.4	13.6	35 08.7	58.0	329 22.6	39	26 44.3	− 65
3	229 43.6	194 03.1	•• 28.4	211 04.8	•• 29.3	234 33.3	•• 13.4	50 11.4	•• 58.1	343 45.5	39	·26 50.8	− 64
4	244 46.1	209 02.7	29.5	226 05.5	30.0	249 35.2	13.1	65 14.0	58.2	358 08.4	39	26 57.2	− 61
5	259 48.5	224 02.2	30.6	241 06.2	30.8	264 37.1	12.9	80 16.7	58.3	12 31.3	38	27 03.3	− 59
6	274 51.0	239 01.8	+14 31.6	256 06.9	+ 7 31.5	279 39.1	− 3 12.7	95 19.3	+ 2 58.3	26 54.1	37	−27 09.2	− 58
7	289 53.4	254 01.3	32.7	271 07.6	32.2	294 41.0	12.4	110 22.0	58.4	41 16.8	36	27 15.0	− 56
8	304 55.9	269 00.9	33.8	286 08.4	33.0	309 42.9	12.2	125 24.6	58.5	55 39.4	36	27 20.6	− 54
9	319 58.4	284 00.4	•• 34.9	301 09.1	•• 33.7	324 44.8	•• 12.0	140 27.2	•• 58.6	70 02.0	36	·27 26.0	− 51
10	335 00.8	299 00.0	36.0	316 09.8	34.4	339 46.7	11.7	155 29.9	58.7	84 24.6	35	27 31.1	− 50
11	350 03.3	313 59.5	37.1	331 10.5	35.2	354 48.6	11.5	170 32.5	58.7	98 47.1	34	27 36.1	− 48
12	5 05.8	328 59.1	+14 38.2	346 11.2	+ 7 35.9	9 50.5	− 3 11.3	185 35.2	+ 2 58.8	113 09.5	34	−27 40.9	− 47
13	20 08.2	343 58.6	39.3	1 11.9	36.6	24 52.5	11.0	200 37.8	58.9	127 31.9	34	27 45.6	− 44
14	35 10.7	358 58.2	40.4	16 12.6	37.4	39 54.4	10.8	215 40.5	59.0	141 54.3	33	27 50.0	− 42
15	50 13.2	13 57.7	•• 41.5	31 13.3	•• 38.1	54 56.3	•• 10.5	230 43.1	•• 59.0	156 16.6	33	·27 54.2	− 40
16	65 15.6	28 57.3	42.6	46 14.0	38.9	69 58.2	10.3	245 45.7	59.1	170 38.9	32	27 58.2	− 39
17	80 18.1	43 56.8	43.7	61 14.8	39.6	85 00.1	10.1	260 48.4	59.2	185 01.1	32	28 02.1	− 36
18	95 20.6	58 56.4	+14 44.8	76 15.5	+ 7 40.3	100 02.0	− 3 09.8	275 51.0	+ 2 59.3	199 23.3	32	−28 05.7	− 34
19	110 23.0	73 55.9	45.9	91 16.2	41.1	115 03.9	09.6	290 53.7	59.3	213 45.5	31	28 09.1	− 33
20	125 25.5	88 55.5	47.0	106 16.9	41.8	130 05.8	09.4	305 56.3	59.4	228 07.6	31	28 12.4	− 30
21	140 27.9	103 55.0	•• 48.0	121 17.6	•• 42.5	145 07.8	•• 09.1	320 58.9	•• 59.5	242 29.7	31	·28 15.4	− 29
22	155 30.4	118 54.6	49.1	136 18.3	43.3	160 09.7	08.9	336 01.6	59.6	256 51.8	31	28 18.3	− 26
23	170 32.9	133 54.1	50.2	151 19.0	44.0	175 11.6	08.7	351 04.2	59.7	271 13.9	30	28 20.9	− 25
24	185 35.3	148 53.7	+14 51.3	166 19.7	+ 7 44.7	190 13.5	− 3 08.4	6 06.9	+ 2 59.7	285 35.9	31	−28 23.4	− 22
code	—	− 4	+ 11	+ 8	+ 7	+ 19	+ 2	+ 26	0				

GCT (h)	SUN GHA (° ′)	SUN Dec. (° ′)
0	178 28.8	+ 1 48.0
1	193 29.0	48.9
2	208 29.2	49.9
3	223 29.4 ··	50.9
4	238 29.6	51.9
5	253 29.8	52.9
6	268 30.0	+ 1 53.8
7	283 30.1	54.8
8	298 30.3	55.8
9	313 30.5 ··	56.8
10	328 30.7	57.8
11	343 30.9	58.8
12	358 31.1	+ 1 59.7
13	13 31.3	2 00.7
14	28 31.5	01.7
15	43 31.7 ··	02.7
16	58 31.9	03.7
17	73 32.1	04.6
18	88 32.2	+ 2 05.6
19	103 32.4	06.6
20	118 32.6	07.6
21	133 32.8 ··	08.6
22	148 33.0	09.5
23	163 33.2	10.5
0	178 33.4	+ 2 11.5
1	193 33.6	12.5
2	208 33.8	13.5
3	223 34.0 ··	14.4
4	238 34.2	15.4
5	253 34.3	16.4
6	268 34.5	+ 2 17.4
7	283 34.7	18.4
8	298 34.9	19.4
9	313 35.1 ··	20.3
10	328 35.3	21.3
11	343 35.5	22.3
12	358 35.7	+ 2 23.3
13	13 35.9	24.2
14	28 36.1	25.2
15	43 36.3 ··	26.2
16	58 36.4	27.2
17	73 36.6	28.2
18	88 36.8	+ 2 29.1
19	103 37.0	30.1
20	118 37.2	31.1
21	133 37.4 ··	32.1
22	148 37.6	33.1
23	163 37.8	34.0
0	178 38.0	+ 2 35.0
1	193 38.2	36.0
2	208 38.4	37.0
3	223 38.5 ··	38.0
4	238 38.7	38.9
5	253 38.9	39.9
6	268 39.1	+ 2 40.9
7	283 39.3	41.9
8	298 39.5	42.8
9	313 39.7 ··	43.8
10	328 39.9	44.8
11	343 40.1	45.8
12	358 40.3	+ 2 46.8
13	13 40.5	47.7
14	28 40.6	48.7
15	43 40.8 ··	49.7
16	58 41.0	50.7
17	73 41.2	51.6
18	88 41.4	+ 2 52.6
19	103 41.6	53.6
20	118 41.8	54.6
21	133 42.0 ··	55.6
22	148 42.2	56.5
23	163 42.4	57.5
24	178 42.5	+ 2 58.5
code	—	......+ 9

STARS No.	SHA (° ′)	Dec. (° ′)	Transit Mer. Gr. (h m)
1	358 32.5	+28 49.2	11 49
2	358 22.4	+58 52.8	11 50
3	349 43.1	−18 15.3	12 25
4	339 21.7	+59 59.0	13 06
5	336 01.8	−57 29.1	13 19
6	333 00.8	+89 02.3	13 31
7	328 54.0	+23 14.0	13 48
8	315 54.0	−40 30.1	14 40
9	309 48.0	+49 41.6	15 04
10	291 43.3	+16 24.9	16 16
11	281 57.2	− 8 15.4	16 55
12	281 43.9	+45 57.3	16 56
13	279 22.3	+ 6 18.5	17 05
14	279 12.0	+28 34.3	17 06
15	276 34.0	− 1 13.9	17 16
16	271 52.0	+ 7 24.0	17 35
17	264 17.0	−52 40.3	18 05
18	259 15.0	−16 38.9	18 26
19	255 49.3	−28 54.4	18 39
20	245 48.6	+ 5 21.1	19 19
21	244 24.8	+28 08.9	19 25
22	234 37.1	−59 21.3	20 04
23	223 26.8	−43 14.3	20 48
24	221 49.6	−69 31.1	20 55
25	218 41.9	− 8 26.9	21 07
26	208 33.0	+12 12.3	21 48
27	194 48.0	+62 00.9	22 43
28	183 21.0	+14 50.6	23 28
29	174 01.5	−62 49.9	0 09
30	172 52.9	−56 50.5	0 14
31	168 46.8	−59 25.4	0 30
32	167 00.8	+56 13.3	0 37
33	159 29.7	+55 10.6	1 07
34	159 20.4	−10 54.6	1 08
35	153 35.0	+49 33.1	1 31
36	149 02.6	−36 08.0	1 49
37	146 38.1	+19 25.9	1 59
38	140 55.6	−60 38.2	2 21
39	137 16.3	+74 21.0	2 36
40	126 50.3	+26 52.3	3 18
41	120 38.1	−22 29.2	3 42
42	113 23.6	−26 19.7	4 11
43	109 07.4	−68 56.4	4 28
44	103 06.2	−15 40.2	4 52
45	97 25.4	−37 04.3	5 15
46	96 49.8	+12 35.3	5 17
47	91 07.8	+51 29.2	5 40
48	84 45.9	−34 24.7	6 05
49	81 10.7	+38 43.8	6 20
50	76 56.3	−26 21.7	6 37
51	62 54.0	+ 8 44.0	7 33
52	54 33.0	−56 53.6	8 06
53	50 03.8	+45 05.9	8 24
54	34 33.4	+ 9 38.8	9 26
55	28 42.6	−47 11.9	9 49
56	16 15.8	−29 52.9	10 39
57	14 25.3	+14 56.4	10 46

Lat. (N °)	Sunrise (h m)	Twlt. begins (h m)	Moonrise 26 (h m)	Moonrise 27 (h m)	Moonrise 28 (h m)	Moonrise 29 (h m)
70	5 30	////	0 25	■	■	■
68	5 34	1 39	■	■	■	■
66	5 36	2 16	26 14	2 14	■	■
64	5 39	2 41	25 11	1 11	■	■
62	5 41	3 00	24 36	0 36	2 58	■
60	5 43	3 15	24 11	0 11	2 09	3 53
58	5 44	3 26	23 52	25 38	1 38	3 09
56	5 46	3 36	23 35	25 15	1 15	2 41
54	5 47	3 46	23 21	24 56	0 56	2 18
52	5 48	3 54	23 10	24 40	0 40	2 00
50	5 49	4 00	22 59	24 26	0 26	1 44
45	5 52	4 13	22 37	23 58	25 13	1 13
40	5 53	4 23	22 19	23 36	24 49	0 49
35	5 55	4 31	22 04	23 18	24 29	0 29
30	5 56	4 38	21 51	23 03	24 12	0 12
20	5 59	4 46	21 30	22 36	23 43	24 46
10	6 01	4 51	21 11	22 14	23 19	24 22
0	6 02	4 54	20 54	21 53	22 56	23 59
10	6 04	4 54	20 37	21 32	22 33	23 36
20	6 05	4 52	20 18	21 10	22 09	23 12
30	6 07	4 48	19 57	20 45	21 40	22 43
35	6 08	4 43	19 45	20 30	21 24	22 26
40	6 09	4 38	19 31	20 12	21 04	22 06
45	6 10	4 31	19 15	19 52	20 40	21 42
50	6 12	4 22	18 55	19 26	20 10	21 12
52	6 12	4 18	18 45	19 13	19 56	20 56
54	6 13	4 12	18 35	18 59	19 38	20 38
56	6 14	4 06	18 23	18 43	19 18	20 17
58	6 14	3 59	18 09	18 23	18 52	19 49
60	6 15	3 51	17 53	17 59	18 16	19 09
S						

Lat. (N °)	Sunset (h m)	Twlt. ends (h m)	Moonset 26 (h m)	Moonset 27 (h m)	Moonset 28 (h m)	Moonset 29 (h m)
70	18 43	////	3 34	■	■	■
68	18 40	22 46	4 21	■	■	■
66	18 37	22 04	4 52	3 45	■	■
64	18 34	21 37	5 15	4 50	■	■
62	18 32	21 18	5 33	5 25	5 09	■
60	18 30	21 02	5 49	5 51	5 59	6 27
58	18 28	20 49	6 02	6 11	6 30	7 11
56	18 27	20 39	6 13	6 28	6 54	7 39
54	18 25	20 29	6 23	6 43	7 13	8 02
52	18 24	20 22	6 32	6 55	7 29	8 20
50	18 23	20 15	6 41	7 06	7 43	8 36
45	18 20	20 00	6 58	7 30	8 12	9 07
40	18 18	19 50	7 12	7 49	8 35	9 32
35	18 17	19 42	7 24	8 05	8 53	9 52
30	18 15	19 35	7 35	8 18	9 10	10 09
20	18 13	19 27	7 53	8 42	9 37	10 38
10	18 11	19 21	8 09	9 02	10 01	11 03
0	18 09	19 18	8 24	9 22	10 23	11 26
10	18 07	19 17	8 39	9 41	10 45	11 49
20	18 05	19 18	8 56	10 01	11 08	12 14
30	18 04	19 23	9 15	10 25	11 36	12 42
35	18 03	19 27	9 26	10 40	11 52	12 59
40	18 01	19 31	9 38	10 56	12 11	13 19
45	18 00	19 38	9 53	11 16	12 34	13 43
50	17 59	19 47	10 12	11 40	13 04	14 14
52	17 58	19 51	10 21	11 53	13 19	14 30
54	17 57	19 56	10 30	12 06	13 36	14 48
56	17 57	20 03	10 42	12 22	13 56	15 10
58	17 56	20 09	10 54	12 41	14 22	15 38
60	17 55	20 17	11 10	13 05	14 58	16 18
S						

Equation of Time (App.—Mean)

GCT (h)	26 (m s)	27 (m s)	28 (m s)
0	− 6 05.2	− 5 46.8	− 5 28.5
6	− 6 00.6	− 5 42.2	− 5 23.9
12	− 5 56.0	− 5 37.7	− 5 19.3
18	− 5 51.4	− 5 33.1	− 5 14.8
24	− 5 46.8	− 5 28.5	− 5 10.2

GCT of Transit Meridian of Greenwich

DAY	Moon (h m)	Venus (h m)	Mars (h m)	Jupiter (h m)	Saturn (h m)
26	2 11	14 03	12 58	11 27	23 44
27	3 08	14 03	12 56	11 24	23 40
28	4 08	14 04	12 55	11 21	23 36
29	5 11	14 05	12 54	11 18	23 31

ADDITIONAL ALTITUDE CORRECTIONS

Alt. (°)	Sun's Low'r Limb (′)	Venus (′)	Mars (′)
0–30	0.4	0.1	0.1
30–45	0.4	0.1	0.0
45–60	0.4	0.1	0.0
60–75	0.4	0.0	0.0
75–90	0.4	0.0	0.0

Moon's Lower Limb *Add*

Alt. (°)	26 (′)	27 (′)	28 (′)
0–4	18.9	18.9	18.7
4–8	18.8	18.8	18.7
8–12	18.8	18.8	18.7
12–16	18.8	18.8	18.7
16–20	18.7	18.7	18.6
20–24	18.7	18.7	18.6
24–28	18.6	18.6	18.5
28–32	18.5	18.5	18.4
32–36	18.4	18.4	18.3
36–40	18.3	18.3	18.2
40–44	18.2	18.2	18.1
44–48	18.1	18.1	18.0
48–52	17.9	17.9	17.8
52–56	17.8	17.8	17.7
56–60	17.6	17.6	17.6
60–64	17.5	17.5	17.4
64–68	17.3	17.3	17.2
68–72	17.1	17.1	17.1
72–76	17.0	17.0	16.9
76–80	16.8	16.8	16.8
80–84	16.6	16.6	16.6
84–88	16.4	16.4	16.4
88–90	16.3	16.3	16.3

Add to table, back cover

Moon's Upper Limb *Subtract*

Alt. (°)	26 (′)	27 (′)	28 (′)
0–4	13.7	13.7	13.7
4–8	13.7	13.7	13.7
8–12	13.7	13.7	13.8
12–16	13.7	13.7	13.8
16–20	13.8	13.8	13.9
20–24	13.8	13.8	13.9
24–28	13.9	13.9	14.0
28–32	14.0	14.0	14.1
32–36	14.1	14.1	14.2
36–40	14.2	14.2	14.3
40–44	14.3	14.3	14.4
44–48	14.5	14.5	14.5
48–52	14.6	14.6	14.6
52–56	14.7	14.7	14.8
56–60	14.9	14.9	14.9
60–64	15.0	15.0	15.1
64–68	15.2	15.2	15.2
68–72	15.4	15.4	15.4
72–76	15.5	15.5	15.5
76–80	15.7	15.7	15.7
80–84	15.9	15.9	15.9
84–88	16.1	16.1	16.1
88–90	16.2	16.2	16.2

Subtract from table, back cover

GCT	♈ GHA	VENUS −3.4 GHA	VENUS Dec.	MARS 1.5 GHA	MARS Dec.	JUPITER −1.6 GHA	JUPITER Dec.	SATURN 0.8 GHA	SATURN Dec.	MOON GHA	code	MOON Dec.	code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
0	185 35.3	148 53.7	+14 51.3	166 19.7	+ 7 44.7	190 13.5	− 3 08.4	6 06.9	+ 2 59.7	285 35.9	31	−28 23.4	− 22
1	200 37.8	163 53.2	52.4	181 20.4	45.5	205 15.4	08.2	21 09.5	59.8	299 58.0	30	28 25.6	− 21
2	215 40.3	178 52.7	53.5	196 21.1	46.2	220 17.3	08.0	36 12.2	2 59.9	314 20.0	30	28 27.7	− 18
3	230 42.7	193 52.3	•• 54.6	211 21.9	•• 46.9	235 19.2	•• 07.7	51 14.8	• 3 00.0	328 42.0	30	·28 29.5	− 16
4	245 45.2	208 51.8	55.7	226 22.6	47.7	250 21.2	07.5	66 17.4	00.0	343 04.0	30	28 31.1	− 15
5	260 47.7	223 51.4	56.7	241 23.3	48.4	265 23.1	07.3	81 20.1	00.1	357 26.0	30	28 32.6	− 12
6	275 50.1	238 50.9	+14 57.8	256 24.0	+ 7 49.1	280 25.0	− 3 07.0	96 22.7	+ 3 00.2	11 48.0	29	−28 33.8	− 11
7	290 52.6	253 50.5	14 58.9	271 24.7	49.9	295 26.9	06.8	111 25.4	00.3	26 09.9	30	28 34.9	− 8
8	305 55.1	268 50.0	15 00.0	286 25.4	50.6	310 28.8	06.6	126 28.0	00.3	40 31.9	30	28 35.7	− 7
9	320 57.5	283 49.5	•• 01.1	301 26.1	•• 51.3	325 30.7	•• 06.3	141 30.6	•• 00.4	54 53.9	30	·28 36.4	− 4
10	336 00.0	298 49.1	02.2	316 26.8	52.1	340 32.6	06.1	156 33.3	00.5	69 15.9	30	28 36.8	− 3
11	351 02.4	313 48.6	03.2	331 27.5	52.8	355 34.6	05.9	171 35.9	00.6	83 37.9	30	28 37.1	0
12	6 04.9	328 48.2	+15 04.3	346 28.2	+ 7 53.5	10 36.5	− 3 05.6	186 38.6	+ 3 00.7	97 59.9	31	−28 37.1	+ 2
13	21 07.4	343 47.7	05.4	1 29.0	54.3	25 38.4	05.4	201 41.2	00.7	112 22.0	30	28 36.9	+ 3
14	36 09.8	358 47.2	06.5	16 29.7	55.0	40 40.3	05.2	216 43.8	00.8	126 44.0	31	28 36.6	+ 6
15	51 12.3	13 46.8	•• 07.6	31 30.4	•• 55.7	55 42.2	•• 04.9	231 46.5	•• 00.9	141 06.1	31	·28 36.0	+ 7
16	66 14.8	28 46.3	08.6	46 31.1	56.5	70 44.1	04.7	246 49.1	01.0	155 28.2	31	28 35.3	+ 10
17	81 17.2	43 45.8	09.7	61 31.8	57.2	85 46.0	04.5	261 51.8	01.0	169 50.3	32	28 34.3	+ 11
18	96 19.7	58 45.4	+15 10.8	76 32.5	+ 7 57.9	100 48.0	− 3 04.2	276 54.4	+ 3 01.1	184 12.5	32	−28 33.2	+ 14
19	111 22.2	73 44.9	11.9	91 33.2	58.6	115 49.9	04.0	291 57.1	01.2	198 34.7	32	28 31.8	+ 15
20	126 24.6	88 44.5	12.9	106 33.9	7 59.4	130 51.8	03.7	306 59.7	01.3	212 56.9	32	28 30.3	+ 18
21	141 27.1	103 44.0	•• 14.0	121 34.6	• 8 00.1	145 53.7	•• 03.5	322 02.3	•• 01.3	227 19.1	33	·28 28.5	+ 19
22	156 29.5	118 43.5	15.1	136 35.3	00.8	160 55.6	03.3	337 05.0	01.4	241 41.4	34	28 26.6	+ 22
23	171 32.0	133 43.1	16.2	151 36.1	01.6	175 57.5	03.0	352 07.6	01.5	256 03.8	34	28 24.4	+ 23
0	186 34.5	148 42.6	+15 17.2	166 36.8	+ 8 02.3	190 59.4	− 3 02.8	7 10.3	+ 3 01.6	270 26.2	34	−28 22.1	+ 25
1	201 36.9	163 42.1	18.3	181 37.5	03.0	206 01.4	02.6	22 12.9	01.6	284 48.6	35	28 19.6	+ 27
2	216 39.4	178 41.7	19.4	196 38.2	03.8	221 03.3	02.3	37 15.5	01.7	299 11.1	35	28 16.9	+ 30
3	231 41.9	193 41.2	•• 20.4	211 38.9	•• 04.5	236 05.2	•• 02.1	52 18.2	•• 01.8	313 33.6	36	·28 13.9	+ 31
4	246 44.3	208 40.7	21.5	226 39.6	05.2	251 07.1	01.9	67 20.8	01.9	327 56.2	36	28 10.8	+ 33
5	261 46.8	223 40.3	22.6	241 40.3	06.0	266 09.0	01.6	82 23.5	01.9	342 18.8	37	28 07.5	+ 34
6	276 49.3	238 39.8	+15 23.6	256 41.0	+ 8 06.7	281 10.9	− 3 01.4	97 26.1	+ 3 02.0	356 41.5	38	−28 04.1	+ 37
7	291 51.7	253 39.3	24.7	271 41.7	07.4	296 12.8	01.2	112 28.7	02.1	11 04.3	38	28 00.4	+ 39
8	306 54.2	268 38.9	25.8	286 42.4	08.1	311 14.8	00.9	127 31.4	02.2	25 27.1	39	27 56.5	+ 40
9	321 56.7	283 38.4	•• 26.8	301 43.1	•• 08.9	326 16.7	•• 00.7	142 34.0	•• 02.3	39 50.0	39	·27 52.5	+ 43
10	336 59.1	298 37.9	27.9	316 43.9	09.6	341 18.6	00.5	157 36.7	02.3	54 12.9	41	27 48.2	+ 44
11	352 01.6	313 37.5	29.0	331 44.6	10.3	356 20.5	00.2	172 39.3	02.4	68 36.0	41	27 43.8	+ 46
12	7 04.0	328 37.0	+15 30.0	346 45.3	+ 8 11.1	11 22.4	− 3 00.0	187 41.9	+ 3 02.5	82 59.1	41	−27 39.2	+ 48
13	22 06.5	343 36.5	31.1	1 46.0	11.8	26 24.3	2 59.8	202 44.6	02.6	97 22.2	43	27 34.4	+ 49
14	37 09.0	358 36.1	32.2	16 46.7	12.5	41 26.2	59.5	217 47.2	02.6	111 45.5	43	27 29.5	+ 52
15	52 11.4	13 35.6	•• 33.2	31 47.4	•• 13.2	56 28.2	•• 59.3	232 49.9	•• 02.7	126 08.8	44	·27 24.3	+ 53
16	67 13.9	28 35.1	34.3	46 48.1	14.0	71 30.1	59.1	247 52.5	02.8	140 32.2	45	27 19.0	+ 55
17	82 16.4	43 34.6	35.4	61 48.8	14.7	86 32.0	58.8	262 55.1	02.9	154 55.7	46	27 13.5	+ 57
18	97 18.8	58 34.2	+15 36.4	76 49.5	+ 8 15.4	101 33.9	− 2 58.6	277 57.8	+ 3 02.9	169 19.3	46	−27 07.8	+ 59
19	112 21.3	73 33.7	37.5	91 50.2	16.2	116 35.8	58.4	293 00.4	03.0	183 42.9	47	27 01.9	+ 60
20	127 23.8	88 33.2	38.5	106 50.9	16.9	131 37.7	58.1	308 03.1	03.1	198 06.6	49	26 55.9	+ 62
21	142 26.2	103 32.8	•• 39.6	121 51.7	•• 17.6	146 39.7	•• 57.9	323 05.7	•• 03.2	212 30.5	49	·26 49.7	+ 64
22	157 28.7	118 32.3	40.7	136 52.4	18.3	161 41.6	57.7	338 08.3	03.2	226 54.4	50	26 43.3	+ 65
23	172 31.2	133 31.8	41.7	151 53.1	19.1	176 43.5	57.4	353 11.0	03.3	241 18.4	51	26 36.8	+ 68
0	187 33.6	148 31.3	+15 42.8	166 53.8	+ 8 19.8	191 45.4	− 2 57.2	8 13.6	+ 3 03.4	255 42.5	51	−26 30.0	+ 68
1	202 36.1	163 30.9	43.8	181 54.5	20.5	206 47.3	57.0	23 16.3	03.5	270 06.6	53	26 23.2	+ 71
2	217 38.5	178 30.4	44.9	196 55.2	21.2	221 49.2	56.7	38 18.9	03.5	284 30.9	54	26 16.1	+ 72
3	232 41.0	193 29.9	•• 45.9	211 55.9	•• 22.0	236 51.1	•• 56.5	53 21.6	•• 03.6	298 55.3	55	·26 08.9	+ 74
4	247 43.5	208 29.4	47.0	226 56.6	22.7	251 53.1	56.3	68 24.2	03.7	313 19.8	55	26 01.5	+ 75
5	262 45.9	223 29.0	48.0	241 57.3	23.4	266 55.0	56.0	83 26.8	03.8	327 44.3	57	25 54.0	+ 77
6	277 48.4	238 28.5	+15 49.1	256 58.0	+ 8 24.1	281 56.9	− 2 55.8	98 29.5	+ 3 03.8	342 09.0	58	−25 46.3	+ 79
7	292 50.9	253 28.0	50.1	271 58.7	24.9	296 58.8	55.6	113 32.1	03.9	356 33.8	59	25 38.4	+ 80
8	307 53.3	268 27.5	51.2	286 59.4	25.6	312 00.7	55.3	128 34.7	04.0	10 58.7	59	25 30.4	+ 82
9	322 55.8	283 27.0	•• 52.3	302 00.2	•• 26.3	327 02.6	•• 55.1	143 37.4	•• 04.1	25 23.6	61	·25 22.2	+ 83
10	337 58.3	298 26.6	53.3	317 00.9	27.0	342 04.6	54.9	158 40.0	04.1	39 48.7	62	25 13.9	+ 85
11	353 00.7	313 26.1	54.4	332 01.6	27.8	357 06.5	54.6	173 42.7	04.2	54 13.9	63	25 05.4	+ 86
12	8 03.2	328 25.6	+15 55.4	347 02.3	+ 8 28.5	12 08.4	− 2 54.4	188 45.3	+ 3 04.3	68 39.2	64	−24 56.8	+ 88
13	23 05.7	343 25.1	56.4	2 03.0	29.2	27 10.3	54.2	203 47.9	04.4	83 04.6	65	24 48.0	+ 89
14	38 08.1	358 24.7	57.5	17 03.7	29.9	42 12.2	53.9	218 50.6	04.4	97 30.1	66	24 39.1	+ 91
15	53 10.6	13 24.2	•• 58.5	32 04.4	•• 30.7	57 14.1	•• 53.7	233 53.2	•• 04.5	111 55.7	67	·24 30.0	+ 92
16	68 13.0	28 23.7	15 59.6	47 05.1	31.4	72 16.1	53.5	248 55.9	04.6	126 21.4	68	24 20.8	+ 94
17	83 15.5	43 23.2	16 00.6	62 05.8	32.1	87 18.0	53.2	263 58.5	04.7	140 47.2	69	24 11.4	+ 95
18	98 18.0	58 22.7	+16 01.7	77 06.5	+ 8 32.8	102 19.9	− 2 53.0	279 01.1	+ 3 04.7	155 13.1	71	−24 01.9	+ 96
19	113 20.4	73 22.2	02.7	92 07.2	33.6	117 21.8	52.8	294 03.8	04.8	169 39.2	71	23 52.3	+ 98
20	128 22.9	88 21.8	03.8	107 07.9	34.3	132 23.7	52.5	309 06.4	04.9	184 05.3	72	23 42.5	+ 99
21	143 25.4	103 21.3	•• 04.8	122 08.7	•• 35.0	147 25.6	•• 52.3	324 09.1	•• 05.0	198 31.5	74	·23 32.6	+101
22	158 27.8	118 20.8	05.8	137 09.4	35.7	162 27.6	52.1	339 11.7	05.0	212 57.9	75	23 22.5	+101
23	173 30.3	133 20.3	06.9	152 10.1	36.5	177 29.5	51.8	354 14.3	05.1	227 24.4	75	23 12.4	+103
24	188 32.8	148 19.8	+16 07.9	167 10.8	+ 8 37.2	192 31.4	− 2 51.6	9 17.0	+ 3 05.2	241 50.9	77	−23 02.1	+105
code	—	− 5	+ 11	+ 7	+ 7	+ 19	+ 2	+ 27	+ 1				

GCT	SUN GHA	SUN Dec.
h	° ′	° ′
0	178 42.5	+ 2 58.5
1	193 42.7	2 59.5
2	208 42.9	3 00.4
3	223 43.1	·· 01.4
4	238 43.3	02.4
5	253 43.5	03.4
6	268 43.7	+ 3 04.3
7	283 43.9	05.3
8	298 44.1	06.3
9	313 44.3	·· 07.3
10	328 44.4	08.2
11	343 44.6	09.2
12	358 44.8	+ 3 10.2
13	13 45.0	11.2
14	28 45.2	12.1
15	43 45.4	·· 13.1
16	58 45.6	14.1
17	73 45.8	15.1
18	88 46.0	+ 3 16.0
19	103 46.2	17.0
20	118 46.3	18.0
21	133 46.5	·· 19.0
22	148 46.7	19.9
23	163 46.9	20.9
0	178 47.1	+ 3 21.9
1	193 47.3	22.9
2	208 47.5	23.8
3	223 47.7	·· 24.8
4	238 47.9	25.8
5	253 48.1	26.8
6	268 48.2	+ 3 27.7
7	283 48.4	28.7
8	298 48.6	29.7
9	313 48.8	·· 30.6
10	328 49.0	31.6
11	343 49.2	32.6
12	358 49.4	+ 3 33.6
13	13 49.6	34.5
14	28 49.8	35.5
15	43 50.0	·· 36.5
16	58 50.1	37.5
17	73 50.3	38.4
18	88 50.5	+ 3 39.4
19	103 50.7	40.4
20	118 50.9	41.3
21	133 51.1	·· 42.3
22	148 51.3	43.3
23	163 51.5	44.3
0	178 51.7	+ 3 45.2
1	193 51.8	46.2
2	208 52.0	47.2
3	223 52.2	·· 48.1
4	238 52.4	49.1
5	253 52.6	50.1
6	268 52.8	+ 3 51.1
7	283 53.0	52.0
8	298 53.2	53.0
9	313 53.4	·· 54.0
10	328 53.5	54.9
11	343 53.7	55.9
12	358 53.9	+ 3 56.9
13	13 54.1	57.8
14	28 54.3	58.8
15	43 54.5	· 3 59.8
16	58 54.7	4 00.8
17	73 54.9	01.7
18	88 55.1	+ 4 02.7
19	103 55.2	03.7
20	118 55.4	04.6
21	133 55.6	·· 05.6
22	148 55.8	06.6
23	163 56.0	07.5
24	178 56.2	+ 4 08.5
code	—	+ 9

STARS No.	SHA	Dec.	Transit Mer. Gr.
	° ′	° ′	h m
1	358 32.5	+28 49.2	11 38
2	358 22.4	+58 52.8	11 38
3	349 43.1	−18 15.3	12 13
4	339 21.7	+59 59.0	12 54
5	336 01.8	−57 29.1	13 07
6	333 01.1	+89 02.3	13 19
7	328 54.0	+23 14.0	13 36
8	315 54.0	−40 30.0	14 28
9	309 48.0	+49 41.6	14 52
10	291 43.3	+16 24.9	16 04
11	281 57.2	− 8 15.4	16 43
12	281 43.9	+45 57.3	16 44
13	279 22.3	+ 6 18.5	16 53
14	279 12.0	+28 34.3	16 54
15	276 34.0	− 1 13.9	17 05
16	271 52.0	+ 7 24.0	17 23
17	264 17.0	−52 40.3	17 54
18	259 15.0	−16 38.9	18 14
19	255 49.3	−28 54.4	18 27
20	245 48.6	+ 5 21.1	19 07
21	244 24.8	+28 08.9	19 13
22	234 37.2	−59 21.3	19 52
23	223 26.8	−43 14.3	20 37
24	221 49.6	−69 31.2	20 43
25	218 41.9	− 8 26.9	20 55
26	208 33.0	+12 12.3	21 36
27	194 48.0	+62 01.0	22 31
28	183 21.0	+14 50.6	23 16
29	174 01.4	−62 49.9	23 54
30	172 52.9	−56 50.5	0 02
31	168 46.7	−59 25.5	0 19
32	167 00.8	+56 13.3	0 26
33	159 29.7	+55 10.6	0 56
34	159 20.4	−10 54.6	0 56
35	153 35.0	+49 33.1	1 19
36	149 02.6	−36 08.0	1 37
37	146 38.1	+19 25.9	1 47
38	140 55.5	−60 38.3	2 10
39	137 16.3	+74 21.0	2 24
40	126 50.3	+26 52.3	3 06
41	120 38.1	−22 29.2	3 31
42	113 23.6	−26 19.7	3 59
43	109 07.4	−68 56.4	4 17
44	103 06.1	−15 40.2	4 41
45	97 25.4	−37 04.3	5 03
46	96 49.8	+12 35.3	5 06
47	91 07.8	+51 29.2	5 28
48	84 45.9	−34 24.7	5 54
49	81 10.7	+38 43.8	6 08
50	76 56.3	−26 21.7	6 25
51	62 54.0	+ 8 44.0	7 21
52	54 33.0	−56 53.5	7 54
53	50 03.8	+45 05.9	8 12
54	34 33.3	+ 9 38.8	9 14
55	28 42.6	−47 11.9	9 37
56	16 15.8	−29 52.9	10 27
57	14 25.3	+14 56.4	10 34

Lat.	Sunrise	Twlt. begins	Moonrise 29	30	31	1
N °	h m	h m	h m	h m	h m	h m
70	5 16	////	■	■	■	■
68	5 21	1 00	■	■	■	7 37
66	5 25	1 54	■	■	■	6 28
64	5 28	2 24	■	■	6 43	5 51
62	5 31	2 45	■	■	5 36	5 25
60	5 34	3 02	3 53	4 45	5 00	5 05
58	5 36	3 16	3 09	4 07	4 35	4 48
56	5 38	3 27	2 41	3 40	4 14	4 33
54	5 40	3 36	2 18	3 19	3 57	4 21
52	5 41	3 45	2 00	3 01	3 42	4 10
50	5 43	3 52	1 44	2 46	3 30	4 00
45	5 46	4 07	1 13	2 15	3 03	3 39
40	5 49	4 18	0 49	1 51	2 42	3 22
35	5 51	4 26	0 29	1 32	2 24	3 08
30	5 53	4 33	0 12	1 15	2 09	2 55
20	5 56	4 43	24 46	0 46	1 44	2 34
10	5 59	4 49	24 22	0 22	1 21	2 15
0	6 01	4 53	23 59	25 00	1 00	1 58
10	6 04	4 54	23 36	24 39	0 39	1 40
20	6 06	4 53	23 12	24 17	0 17	1 21
30	6 09	4 49	22 43	23 51	24 59	0 59
35	6 11	4 46	22 26	23 35	24 46	0 46
40	6 12	4 41	22 06	23 17	24 31	0 31
45	6 14	4 35	21 42	22 55	24 14	0 14
50	6 16	4 27	21 12	22 28	23 52	25 16
52	6 17	4 23	20 56	22 14	23 41	25 09
54	6 19	4 18	20 38	21 58	23 29	25 00
56	6 20	4 13	20 17	21 40	23 15	24 51
58	6 21	4 07	19 49	21 17	22 59	24 40
60	6 23	3 59	19 09	20 47	22 39	24 27
S						

Lat.	Sunset	Twlt. ends	Moonset 29	30	31	1
N °	h m	h m	h m	h m	h m	h m
70	18 56	////	■	■	■	■
68	18 51	23 33	■	■	■	9 00
66	18 47	22 27	■	■	■	10 10
64	18 43	21 54	■	■	7 55	10 45
62	18 40	21 31	■	■	9 03	11 11
60	18 37	21 13	6 27	7 47	9 38	11 30
58	18 35	20 59	7 11	8 25	10 03	11 47
56	18 33	20 47	7 39	8 52	10 23	12 00
54	18 31	20 37	8 02	9 13	10 40	12 12
52	18 29	20 28	8 20	9 30	10 54	12 23
50	18 28	20 21	8 36	9 45	11 07	12 32
45	18 24	20 05	9 07	10 15	11 32	12 51
40	18 22	19 54	9 32	10 39	11 52	13 07
35	18 19	19 45	9 52	10 58	12 09	13 20
30	18 17	19 38	10 09	11 15	12 23	13 31
20	18 14	19 28	10 38	11 43	12 48	13 51
10	18 11	19 21	11 03	12 06	13 09	14 08
0	18 08	19 17	11 26	12 29	13 28	14 23
10	18 05	19 15	11 49	12 51	13 48	14 39
20	18 03	19 16	12 14	13 14	14 08	14 55
30	18 00	19 19	12 42	13 41	14 32	15 14
35	17 58	19 22	12 59	13 57	14 46	15 25
40	17 57	19 27	13 19	14 16	15 01	15 37
45	17 55	19 33	13 43	14 39	15 20	15 52
50	17 52	19 40	14 14	15 07	15 44	16 09
52	17 51	19 44	14 30	15 21	15 55	16 18
54	17 50	19 48	14 48	15 37	16 07	16 27
56	17 49	19 54	15 10	15 56	16 22	16 37
58	17 47	19 59	15 38	16 19	16 39	16 49
60	17 46	20 07	16 18	16 49	16 59	17 02
S						

GCT	Equation of Time (App.—Mean) 29	30	31
h	m s	m s	m s
0	− 5 10.2	− 4 51.9	− 4 33.8
6	− 5 05.6	− 4 47.4	− 4 29.2
12	− 5 01.1	− 4 42.8	− 4 24.7
18	− 4 56.5	− 4 38.3	− 4 20.2
24	− 4 51.9	− 4 33.8	− 4 15.7

GCT of Transit Meridian of Greenwich

DAY	Moon	Venus	Mars	Jupiter	Saturn
	h m	h m	h m	h m	h m
29	5 11	14 05	12 54	11 18	23 31
30	6 14	14 06	12 53	11 15	23 27
31	7 14	14 06	12 52	11 12	23 23
1	8 11	14 07	12 51	11 09	23 19

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb	Venus	Mars
°	′	′	′
0	0.3	0.1	0.1
30	0.3	0.1	0.0
45	0.3	0.1	0.0
60	0.3	0.0	0.0
75	0.3	0.0	0.0
90			

Moon's Lower Limb
Add

Alt.	29	30	31
°	′	′	′
0	18.5	18.2	17.7
4	18.5	18.2	17.7
8	18.4	18.2	17.7
12	18.4	18.2	17.7
16	18.4	18.1	17.6
20	18.3	18.1	17.6
24	18.2	18.0	17.5
28	18.2	17.9	17.5
32	18.1	17.9	17.4
36	18.0	17.8	17.4
40	17.9	17.7	17.3
44	17.8	17.6	17.2
48	17.7	17.5	17.1
52	17.5	17.4	17.0
56	17.4	17.2	16.9
60	17.3	17.1	16.8
64	17.1	17.0	16.7
68	17.0	16.8	16.6
72	16.8	16.7	16.5
76	16.7	16.6	16.4
80	16.5	16.4	16.3
84	16.3	16.3	16.1
88	16.2	16.2	16.0
90			

Add to table, back cover

Moon's Upper Limb
Subtract

Alt.	29	30	31
°	′	′	′
0	13.9	14.0	14.3
4	13.9	14.0	14.3
8	13.9	14.1	14.3
12	13.9	14.1	14.4
16	14.0	14.1	14.4
20	14.0	14.2	14.4
24	14.1	14.2	14.5
28	14.2	14.3	14.5
32	14.3	14.4	14.6
36	14.4	14.5	14.7
40	14.5	14.6	14.8
44	14.6	14.7	14.8
48	14.7	14.8	14.9
52	14.8	14.9	15.0
56	15.0	15.0	15.1
60	15.1	15.1	15.2
64	15.2	15.3	15.3
68	15.4	15.4	15.4
72	15.5	15.5	15.5
76	15.7	15.7	15.7
80	15.9	15.8	15.8
84	16.0	16.0	15.9
88	16.1	16.1	16.0
90			

Subtract from table, back cover

Last Quarter 30

GCT	♈	VENUS −3.4		MARS 1.5		JUPITER −1.6		SATURN 0.8		MOON			
	GHA	GHA	Dec.	GHA	Dec.	GHA	Dec.	GHA	Dec.	GHA	code	Dec.	code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
0	188 32.8	148 19.8	+16 07.9	167 10.8	+ 8 37.2	192 31.4	− 2 51.6	9 17.0	+ 3 05.2	241 50.9	77	−23 02.1	+105
1	203 35.2	163 19.4	09.0	182 11.5	37.9	207 33.3	51.4	24 19.6	05.3	256 17.6	78	22 51.6	+105
2	218 37.7	178 18.9	10.0	197 12.2	38.6	222 35.2	51.1	39 22.3	05.3	270 44.4	79	22 41.1	+107
3	233 40.1	193 18.4	11.1	212 12.9	39.3	237 37.1	50.9	54 24.9	05.4	285 11.3	81	22 30.4	+109
4	248 42.6	208 17.9	12.1	227 13.6	40.1	252 39.0	50.7	69 27.5	05.5	299 38.4	81	22 19.5	+109
5	263 45.1	223 17.4	13.1	242 14.3	40.8	267 41.0	50.4	84 30.2	05.6	314 05.5	82	22 08.6	+111
6	278 47.5	238 16.9	+16 14.2	257 15.0	+ 8 41.5	282 42.9	− 2 50.2	99 32.8	+ 3 05.6	328 32.7	84	−21 57.5	+111
7	293 50.0	253 16.4	15.2	272 15.7	42.2	297 44.8	50.0	114 35.5	05.7	343 00.1	84	21 46.4	+113
8	308 52.5	268 16.0	16.2	287 16.4	42.9	312 46.7	49.7	129 38.1	05.8	357 27.5	86	21 35.1	+114
9	323 54.9	283 15.5	17.3	302 17.1	43.7	327 48.6	49.5	144 40.7	05.9	11 55.1	87	21 23.7	+116
10	338 57.4	298 15.0	18.3	317 17.8	44.4	342 50.5	49.3	159 43.4	05.9	26 22.8	88	21 12.1	+116
11	353 59.9	313 14.5	19.3	332 18.6	45.1	357 52.5	49.0	174 46.0	06.0	40 50.6	88	21 00.5	+118
12	9 02.3	328 14.0	+16 20.4	347 19.3	+ 8 45.8	12 54.4	− 2 48.8	189 48.6	+ 3 06.1	55 18.4	90	−20 48.7	+118
13	24 04.8	343 13.5	21.4	2 20.0	46.6	27 56.3	48.6	204 51.3	06.2	69 46.4	92	20 36.9	+120
14	39 07.3	358 13.0	22.4	17 20.7	47.3	42 58.2	48.3	219 53.9	06.2	84 14.6	92	20 24.9	+121
15	54 09.7	13 12.5	23.5	32 21.4	48.0	58 00.1	48.1	234 56.6	06.3	98 42.8	93	20 12.8	+121
16	69 12.2	28 12.0	24.5	47 22.1	48.7	73 02.0	47.9	249 59.2	06.4	113 11.1	94	20 00.7	+123
17	84 14.6	43 11.6	25.5	62 22.8	49.4	88 04.0	47.6	265 01.8	06.5	127 39.5	95	19 48.4	+124
18	99 17.1	58 11.1	+16 26.6	77 23.5	+ 8 50.2	103 05.9	− 2 47.4	280 04.5	+ 3 06.5	142 08.0	97	−19 36.0	+125
19	114 19.6	73 10.6	27.6	92 24.2	50.9	118 07.8	47.2	295 07.1	06.6	156 36.7	97	19 23.5	+125
20	129 22.0	88 10.1	28.6	107 24.9	51.6	133 09.7	46.9	310 09.7	06.7	171 05.4	99	19 11.0	+127
21	144 24.5	103 09.6	29.6	122 25.6	52.3	148 11.6	46.7	325 12.4	06.8	185 34.3	99	18 58.3	+128
22	159 27.0	118 09.1	30.7	137 26.3	53.0	163 13.6	46.5	340 15.0	06.8	200 03.2	101	18 45.5	+128
23	174 29.4	133 08.6	31.7	152 27.0	53.7	178 15.5	46.2	355 17.7	06.9	214 32.3	101	18 32.7	+130
0	189 31.9	148 08.1	+16 32.7	167 27.7	+ 8 54.5	193 17.4	− 2 46.0	10 20.3	+ 3 07.0	229 01.4	103	−18 19.7	+130
1	204 34.4	163 07.6	33.7	182 28.4	55.2	208 19.3	45.8	25 22.9	07.1	243 30.7	103	18 06.7	+131
2	219 36.8	178 07.1	34.8	197 29.2	55.9	223 21.2	45.5	40 25.6	07.1	258 00.0	105	17 53.6	+133
3	234 39.3	193 06.6	35.8	212 29.9	56.6	238 23.1	45.3	55 28.2	07.2	272 29.5	105	17 40.3	+132
4	249 41.8	208 06.1	36.8	227 30.6	57.3	253 25.1	45.1	70 30.9	07.3	286 59.0	107	17 27.1	+134
5	264 44.2	223 05.6	37.8	242 31.3	58.1	268 27.0	44.8	85 33.5	07.4	301 28.7	107	17 13.7	+135
6	279 46.7	238 05.1	+16 38.8	257 32.0	+ 8 58.8	283 28.9	− 2 44.6	100 36.1	+ 3 07.4	315 58.4	109	−17 00.2	+135
7	294 49.1	253 04.7	39.9	272 32.7	8 59.5	298 30.8	44.4	115 38.8	07.5	330 28.3	109	16 46.7	+136
8	309 51.6	268 04.2	40.9	287 33.4	9 00.2	313 32.7	44.1	130 41.4	07.6	344 58.2	110	16 33.1	+137
9	324 54.1	283 03.7	41.9	302 34.1	00.9	328 34.6	43.9	145 44.0	07.7	359 28.2	112	16 19.4	+138
10	339 56.5	298 03.2	42.9	317 34.8	01.6	343 36.6	43.7	160 46.7	07.7	13 58.4	112	16 05.6	+138
11	354 59.0	313 02.7	43.9	332 35.5	02.4	358 38.5	43.4	175 49.3	07.8	28 28.6	113	15 51.8	+139
12	10 01.5	328 02.2	+16 44.9	347 36.2	+ 9 03.1	13 40.4	− 2 43.2	190 52.0	+ 3 07.9	42 58.9	114	−15 37.9	+140
13	25 03.9	343 01.7	46.0	2 36.9	03.8	28 42.3	43.0	205 54.6	08.0	57 29.3	115	15 23.9	+141
14	40 06.4	358 01.2	47.0	17 37.6	04.5	43 44.2	42.7	220 57.2	08.0	71 59.8	116	15 09.8	+141
15	55 08.9	13 00.7	48.0	32 38.3	05.2	58 46.2	42.5	235 59.9	08.1	86 30.4	116	14 55.7	+142
16	70 11.3	28 00.2	49.0	47 39.0	05.9	73 48.1	42.3	251 02.5	08.2	101 01.0	118	14 41.5	+142
17	85 13.8	42 59.7	50.0	62 39.7	06.7	88 50.0	42.0	266 05.1	08.2	115 31.8	118	14 27.3	+143
18	100 16.3	57 59.2	+16 51.0	77 40.5	+ 9 07.4	103 51.9	− 2 41.8	281 07.8	+ 3 08.3	130 02.6	119	−14 13.0	+144
19	115 18.7	72 58.7	52.0	92 41.2	08.1	118 53.8	41.6	296 10.4	08.4	144 33.5	121	13 58.6	+144
20	130 21.2	87 58.2	53.0	107 41.9	08.8	133 55.7	41.3	311 13.0	08.5	159 04.6	120	13 44.2	+145
21	145 23.6	102 57.7	54.1	122 42.6	09.5	148 57.7	41.1	326 15.7	08.5	173 35.6	122	13 29.7	+145
22	160 26.1	117 57.2	55.1	137 43.3	10.2	163 59.6	40.9	341 18.3	08.6	188 06.8	123	13 15.2	+146
23	175 28.6	132 56.7	56.1	152 44.0	10.9	179 01.5	40.6	356 21.0	08.7	202 38.1	123	13 00.6	+147
0	190 31.0	147 56.2	+16 57.1	167 44.7	+ 9 11.7	194 03.4	− 2 40.4	11 23.6	+ 3 08.8	217 09.4	124	−12 45.9	+147
1	205 33.5	162 55.7	58.1	182 45.4	12.4	209 05.3	40.2	26 26.2	08.8	231 40.8	125	12 31.2	+147
2	220 36.0	177 55.2	16 59.1	197 46.1	13.1	224 07.3	39.9	41 28.9	08.9	246 12.3	126	12 16.5	+148
3	235 38.4	192 54.7	17 00.1	212 46.8	13.8	239 09.2	39.7	56 31.5	09.0	260 43.9	126	12 01.7	+149
4	250 40.9	207 54.1	01.1	227 47.5	14.5	254 11.1	39.5	71 34.1	09.1	275 15.5	127	11 46.8	+148
5	265 43.4	222 53.6	02.1	242 48.2	15.2	269 13.0	39.2	86 36.8	09.1	289 47.2	128	11 32.0	+150
6	280 45.8	237 53.1	+17 03.1	257 48.9	+ 9 15.9	284 14.9	− 2 39.0	101 39.4	+ 3 09.2	304 19.0	129	−11 17.0	+150
7	295 48.3	252 52.6	04.1	272 49.6	16.7	299 16.8	38.8	116 42.1	09.3	318 50.9	129	11 02.0	+150
8	310 50.7	267 52.1	05.1	287 50.3	17.4	314 18.8	38.5	131 44.7	09.3	333 22.8	130	10 47.0	+151
9	325 53.2	282 51.6	06.1	302 51.0	18.1	329 20.7	38.3	146 47.3	09.4	347 54.8	130	10 31.9	+151
10	340 55.7	297 51.1	07.1	317 51.7	18.8	344 22.6	38.1	161 50.0	09.5	2 26.8	132	10 16.8	+151
11	355 58.1	312 50.6	08.1	332 52.4	19.5	359 24.5	37.8	176 52.6	09.6	16 59.0	132	10 01.7	+152
12	11 00.6	327 50.1	+17 09.1	347 53.1	+ 9 20.2	14 26.4	− 2 37.6	191 55.2	+ 3 09.6	31 31.2	132	− 9 46.5	+152
13	26 03.1	342 49.6	10.1	2 53.9	20.9	29 28.4	37.4	206 57.9	09.7	46 03.4	133	9 31.3	+152
14	41 05.5	357 49.1	11.1	17 54.6	21.6	44 30.3	37.2	222 00.5	09.8	60 35.7	134	9 16.1	+153
15	56 08.0	12 48.6	12.1	32 55.3	22.4	59 32.2	36.9	237 03.1	09.9	75 08.1	135	9 00.8	+153
16	71 10.5	27 48.1	13.1	47 56.0	23.1	74 34.1	36.7	252 05.8	09.9	89 40.6	135	8 45.5	+154
17	86 12.9	42 47.6	14.1	62 56.7	23.8	89 36.0	36.5	267 08.4	10.0	104 13.1	135	8 30.1	+153
18	101 15.4	57 47.0	+17 15.1	77 57.4	+ 9 24.5	104 38.0	− 2 36.2	282 11.0	+ 3 10.1	118 45.6	137	− 8 14.8	+154
19	116 17.9	72 46.5	16.1	92 58.1	25.2	119 39.9	36.0	297 13.7	10.2	133 18.3	136	7 59.4	+154
20	131 20.3	87 46.0	17.1	107 58.8	25.9	134 41.8	35.8	312 16.3	10.2	147 50.9	138	7 44.0	+155
21	146 22.8	102 45.5	18.1	122 59.5	26.6	149 43.7	35.5	327 19.0	10.3	162 23.7	138	7 28.5	+155
22	161 25.2	117 45.0	19.1	138 00.2	27.3	164 45.6	35.3	342 21.6	10.4	176 56.5	138	7 13.0	+154
23	176 27.7	132 44.5	20.0	153 00.9	28.0	179 47.6	35.1	357 24.2	10.4	191 29.3	139	6 57.6	+156
24	191 30.2	147 44.0	+17 21.0	168 01.6	+ 9 28.8	194 49.5	− 2 34.8	12 26.9	+ 3 10.5	206 02.2	139	− 6 42.0	+155
code	—	− 5	+ 11	+ 7	+ 7	+ 19	+ 2	+ 26	+ 1				

GCT h	SUN GHA ° ′	SUN Dec. ° ′
0	178 56.2	+ 4 08.5
1	193 56.4	09.5
2	208 56.6	10.4
3	223 56.7	·· 11.4
4	238 56.9	12.4
5	253 57.1	13.3
6	268 57.3	+ 4 14.3
7	283 57.5	15.3
8	298 57.7	16.3
9	313 57.9	·· 17.2
10	328 58.1	18.2
11	343 58.2	19.2
12	358 58.4	+ 4 20.1
13	13 58.6	21.1
14	28 58.8	22.1
15	43 59.0	·· 23.0
16	58 59.2	24.0
17	73 59.4	25.0
18	88 59.6	+ 4 25.9
19	103 59.7	26.9
20	118 59.9	27.8
21	134 00.1	·· 28.8
22	149 00.3	29.8
23	164 00.5	30.7
0	179 00.7	+ 4 31.7
1	194 00.9	32.7
2	209 01.0	33.6
3	224 01.2	·· 34.6
4	239 01.4	35.6
5	254 01.6	36.5
6	269 01.8	+ 4 37.5
7	284 02.0	38.5
8	299 02.2	39.4
9	314 02.4	·· 40.4
10	329 02.5	41.4
11	344 02.7	42.3
12	359 02.9	+ 4 43.3
13	14 03.1	44.2
14	29 03.3	45.2
15	44 03.5	·· 46.2
16	59 03.7	47.1
17	74 03.8	48.1
18	89 04.0	+ 4 49.1
19	104 04.2	50.0
20	119 04.4	51.0
21	134 04.6	·· 51.9
22	149 04.8	52.9
23	164 05.0	53.9
0	179 05.1	+ 4 54.8
1	194 05.3	55.8
2	209 05.5	56.8
3	224 05.7	·· 57.7
4	239 05.9	58.7
5	254 06.1	4 59.6
6	269 06.3	+ 5 00.6
7	284 06.4	01.6
8	299 06.6	02.5
9	314 06.8	·· 03.5
10	329 07.0	04.4
11	344 07.2	05.4
12	359 07.4	+ 5 06.4
13	14 07.5	07.3
14	29 07.7	08.3
15	44 07.9	·· 09.2
16	59 08.1	10.2
17	74 08.3	11.2
18	89 08.5	+ 5 12.1
19	104 08.7	13.1
20	119 08.8	14.0
21	134 09.0	·· 15.0
22	149 09.2	16.0
23	164 09.4	16.9
24	179 09.6	+ 5 17.9
code	—	+ 9

STARS No.	SHA ° ′	Dec. ° ′	Transit Mer. Gr. h m
1	358 32.5	+28 49.2	11 26
2	358 22.4	+58 52.8	11 27
3	349 43.1	−18 15.3	12 01
4	339 21.7	+59 59.0	12 42
5	336 01.8	−57 29.1	12 56
6	333 01.3	+89 02.3	13 08
7	328 54.0	+23 14.0	13 24
8	315 54.0	−40 30.0	14 16
9	309 48.0	+49 41.6	14 40
10	291 43.3	+16 24.9	15 52
11	281 57.2	− 8 15.4	16 31
12	281 43.9	+45 57.3	16 32
13	279 22.4	+ 6 18.5	16 42
14	279 12.0	+28 34.3	16 42
15	276 34.0	− 1 13.9	16 53
16	271 52.1	+ 7 24.0	17 12
17	264 17.0	−52 40.3	17 42
18	259 15.0	−16 38.9	18 02
19	255 49.3	−28 54.4	18 16
20	245 48.6	+ 5 21.1	18 56
21	244 24.8	+28 08.9	19 01
22	234 37.2	−59 21.3	19 40
23	223 26.8	−43 14.3	20 25
24	221 49.7	−69 31.2	20 31
25	218 41.9	− 8 26.9	20 44
26	208 33.0	+12 12.3	21 24
27	194 48.0	+62 01.0	22 19
28	183 21.0	+14 50.6	23 05
29	174 01.4	−62 49.9	23 42
30	172 52.9	−56 50.6	23 46
31	168 46.7	−59 25.5	0 07
32	167 00.8	+56 13.3	0 14
33	159 29.7	+55 10.6	0 44
34	159 20.4	−10 54.6	0 44
35	153 35.0	+49 33.1	1 07
36	149 02.6	−36 08.0	1 25
37	146 38.1	+19 25.9	1 35
38	140 55.5	−60 38.3	1 58
39	137 16.2	+74 21.0	2 12
40	126 50.3	+26 52.3	2 54
41	120 38.1	−22 29.3	3 19
42	113 23.6	−26 19.7	3 48
43	109 07.3	−68 56.4	4 05
44	103 06.1	−15 40.2	4 29
45	97 25.4	−37 04.3	4 51
46	96 49.8	+12 35.3	4 54
47	91 07.8	+51 29.2	5 16
48	84 45.8	−34 24.7	5 42
49	81 10.7	+38 43.8	5 56
50	76 56.3	−26 21.7	6 13
51	62 54.0	+ 8 44.0	7 09
52	54 32.9	−56 53.5	7 42
53	50 03.7	+45 05.9	8 00
54	34 33.3	+ 9 38.8	9 02
55	28 42.6	−47 11.9	9 25
56	16 15.8	−29 52.9	10 15
57	14 25.3	+14 56.4	10 22

Lat.	Sunrise	Twlt. begins	Moonrise 1	Moonrise 2	Moonrise 3	Moonrise 4
N °	h m	h m	h m	h m	h m	h m
70	5 02	////	■	6 46	5 58	5 26
68	5 08	////	7 37	6 15	5 43	5 20
66	5 13	1 25	6 28	5 52	5 31	5 15
64	5 18	2 04	5 51	5 34	5 21	5 11
62	5 21	2 30	5 25	5 18	5 12	5 07
60	5 25	2 49	5 05	5 05	5 05	5 04
58	5 28	3 04	4 48	4 54	4 58	5 01
56	5 30	3 17	4 33	4 45	4 52	4 58
54	5 32	3 27	4 21	4 36	4 47	4 56
52	5 34	3 37	4 10	4 28	4 42	4 54
50	5 36	3 44	4 00	4 21	4 38	4 52
45	5 40	4 00	3 39	4 06	4 28	4 47
40	5 44	4 12	3 22	3 54	4 20	4 43
35	5 47	4 22	3 08	3 43	4 14	4 40
30	5 49	4 29	2 55	3 34	4 07	4 38
20	5 53	4 40	2 34	3 18	3 57	4 33
10	5 57	4 48	2 15	3 04	3 48	4 28
0	6 01	4 52	1 58	2 50	3 39	4 24
10	6 04	4 54	1 40	2 37	3 30	4 20
20	6 07	4 54	1 21	2 23	3 21	4 16
30	6 11	4 51	0 59	2 06	3 10	4 11
35	6 13	4 48	0 46	1 56	3 04	4 08
40	6 15	4 44	0 31	1 45	2 57	4 05
45	6 18	4 39	0 14	1 32	2 48	4 01
50	6 21	4 31	25 16	1 16	2 38	3 57
52	6 22	4 28	25 09	1 09	2 33	3 55
54	6 24	4 24	25 00	1 00	2 28	3 52
56	6 26	4 20	24 51	0 51	2 22	3 50
58	6 28	4 13	24 40	0 40	2 16	3 47
60	6 30	4 07	24 27	0 27	2 08	3 44
S						

Lat.	Sunset	Twlt. ends	Moonset 1	Moonset 2	Moonset 3	Moonset 4
N °	h m	h m	h m	h m	h m	h m
70	19 08	////	■	11 43	14 10	16 16
68	19 02	////	9 00	12 12	14 23	16 19
66	18 56	22 56	10 10	12 33	14 33	16 22
64	18 52	22 13	10 45	12 50	14 41	16 24
62	18 48	21 45	11 11	13 04	14 48	16 26
60	18 44	21 24	11 30	13 16	14 54	16 27
58	18 41	21 08	11 47	13 26	15 00	16 29
56	18 39	20 56	12 00	13 35	15 04	16 30
54	18 36	20 44	12 12	13 42	15 09	16 31
52	18 34	20 35	12 23	13 49	15 12	16 32
50	18 32	20 27	12 32	13 56	15 16	16 33
45	18 28	20 10	12 51	14 09	15 23	16 35
40	18 25	19 58	13 07	14 20	15 30	16 37
35	18 22	19 48	13 20	14 29	15 35	16 38
30	18 19	19 40	13 31	14 37	15 39	16 40
20	18 14	19 28	13 51	14 51	15 47	16 42
10	18 11	19 21	14 08	15 03	15 54	16 44
0	18 07	19 16	14 23	15 14	16 01	16 45
10	18 04	19 14	14 39	15 25	16 07	16 47
20	18 00	19 13	14 55	15 37	16 14	16 49
30	17 56	19 15	15 14	15 50	16 22	16 51
35	17 54	19 18	15 25	15 58	16 26	16 52
40	17 52	19 22	15 37	16 06	16 31	16 53
45	17 49	19 27	15 52	16 16	16 37	16 55
50	17 46	19 34	16 09	16 28	16 43	16 56
52	17 44	19 36	16 18	16 34	16 46	16 57
54	17 43	19 41	16 27	16 40	16 50	16 58
56	17 41	19 45	16 37	16 47	16 53	16 59
58	17 39	19 50	16 49	16 54	16 57	17 00
60	17 37	19 57	17 02	17 03	17 02	17 01
S						

ADDITIONAL ALTITUDE CORRECTIONS

Alt. °	Sun's Low'r Limb ′	Venus ′	Mars ′
0			
	0.3	0.1	0.1
30			
	0.3	0.1	0.0
45			
	0.3	0.1	0.0
60			
	0.3	0.0	0.0
75			
	0.3	0.0	0.0
90			

Moon's Lower Limb

Add

Alt. °	1 ′	2 ′	3 ′
0			
	17.2	16.7	16.2
4			
	17.2	16.7	16.2
8			
	17.2	16.7	16.2
12			
	17.2	16.7	16.2
16			
	17.1	16.7	16.2
20			
	17.1	16.6	16.2
24			
	17.1	16.6	16.1
28			
	17.0	16.6	16.1
32			
	17.0	16.5	16.1
36			
	16.9	16.5	16.1
40			
	16.9	16.5	16.1
44			
	16.8	16.4	16.0
48			
	16.7	16.4	16.0
52			
	16.7	16.3	16.0
56			
	16.6	16.3	16.0
60			
	16.5	16.2	15.9
64			
	16.4	16.2	15.9
68			
	16.4	16.1	15.9
72			
	16.3	16.0	15.8
76			
	16.2	16.0	15.8
80			
	16.1	15.9	15.8
84			
	16.0	15.9	15.7
88			
	15.9	15.8	15.7
90			

Add to table, back cover

Moon's Upper Limb

Subtract

Alt. °	1 ′	2 ′	3 ′
0			
	14.6	14.9	15.2
4			
	14.6	14.9	15.2
8			
	14.6	14.9	15.2
12			
	14.6	14.9	15.2
16			
	14.7	14.9	15.2
20			
	14.7	15.0	15.2
24			
	14.7	15.0	15.2
28			
	14.8	15.0	15.3
32			
	14.8	15.0	15.3
36			
	14.9	15.1	15.3
40			
	14.9	15.1	15.3
44			
	15.0	15.2	15.3
48			
	15.1	15.2	15.4
52			
	15.1	15.3	15.4
56			
	15.2	15.3	15.4
60			
	15.3	15.4	15.5
64			
	15.4	15.4	15.5
68			
	15.5	15.5	15.5
72			
	15.5	15.5	15.5
76			
	15.6	15.6	15.6
80			
	15.7	15.7	15.6
84			
	15.8	15.7	15.7
88			
	15.9	15.8	15.7
90			

Subtract from table, back cover

GCT h	Equation of Time (App.—Mean) 1 m s	2 m s	3 m s
0	− 4 15.7	− 3 57.7	− 3 39.8
6	− 4 11.1	− 3 53.2	− 3 35.3
12	− 4 06.6	− 3 48.7	− 3 30.9
18	− 4 02.2	− 3 44.2	− 3 26.5
24	− 3 57.7	− 3 39.8	− 3 22.1

GCT of Transit Meridian of Greenwich

DAY	Moon h m	Venus h m	Mars h m	Jupiter h m	Saturn h m
1	8 11	14 07	12 51	11 09	23 19
2	9 02	14 08	12 50	11 05	23 15
3	9 50	14 09	12 48	11 02	23 10
4	10 35	14 10	12 47	10 59	23 06

GCT	♈ GHA	VENUS −3.4 GHA	VENUS Dec.	MARS 1.5 GHA	MARS Dec.	JUPITER −1.6 GHA	JUPITER Dec.	SATURN 0.8 GHA	SATURN Dec.	MOON GHA	code	MOON Dec.	code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
0	191 30.2	147 44.0	+17 21.0	168 01.6	+ 9 28.8	194 49.5	− 2 34.8	12 26.9	+ 3 10.5	206 02.2	139	− 6 42.0	+155
1	206 32.6	162 43.5	22.0	183 02.3	29.5	209 51.4	34.6	27 29.5	10.6	220 35.1	140	6 26.5	+155
2	221 35.1	177 43.0	23.0	198 03.0	30.2	224 53.3	34.4	42 32.1	10.7	235 08.1	141	6 11.0	+156
3	236 37.6	192 42.4	·· 24.0	213 03.7	·· 30.9	239 55.2	·· 34.1	57 34.8	·· 10.7	249 41.2	140	· 5 55.4	+156
4	251 40.0	207 41.9	25.0	228 04.4	31.6	254 57.2	33.9	72 37.4	10.8	264 14.2	142	5 39.8	+156
5	266 42.5	222 41.4	26.0	243 05.1	32.3	269 59.1	33.7	87 40.0	10.9	278 47.4	141	5 24.2	+156
6	281 45.0	237 40.9	+17 27.0	258 05.8	+ 9 33.0	285 01.0	− 2 33.4	102 42.7	+ 3 11.0	293 20.5	143	− 5 08.6	+156
7	296 47.4	252 40.4	27.9	273 06.5	33.7	300 02.9	33.2	117 45.3	11.0	307 53.8	142	4 53.0	+156
8	311 49.9	267 39.9	28.9	288 07.2	34.4	315 04.8	33.0	132 47.9	11.1	322 27.0	143	4 37.4	+157
9	326 52.3	282 39.4	·· 29.9	303 07.9	·· 35.1	330 06.7	·· 32.7	147 50.6	·· 11.2	337 00.3	144	· 4 21.7	+156
10	341 54.8	297 38.8	30.9	318 08.6	35.8	345 08.7	32.5	162 53.2	11.2	351 33.7	143	4 06.1	+157
11	356 57.3	312 38.3	31.9	333 09.3	36.6	0 10.6	32.3	177 55.9	11.3	6 07.0	145	3 50.4	+156
12	11 59.7	327 37.8	+17 32.8	348 10.0	+ 9 37.3	15 12.5	− 2 32.1	192 58.5	+ 3 11.4	20 40.5	144	− 3 34.8	+157
13	27 02.2	342 37.3	33.8	3 10.8	38.0	30 14.4	31.8	208 01.1	11.5	35 13.9	145	3 19.1	+157
14	42 04.7	357 36.8	34.8	18 11.5	38.7	45 16.3	31.6	223 03.8	11.5	49 47.4	145	3 03.4	+156
15	57 07.1	12 36.2	·· 35.8	33 12.2	·· 39.4	60 18.3	·· 31.4	238 06.4	·· 11.6	64 20.9	146	· 2 47.8	+157
16	72 09.6	27 35.7	36.8	48 12.9	40.1	75 20.2	31.1	253 09.0	11.7	78 54.5	145	2 32.1	+157
17	87 12.1	42 35.2	37.7	63 13.6	40.8	90 22.1	30.9	268 11.7	11.7	93 28.0	147	2 16.4	+157
18	102 14.5	57 34.7	+17 38.7	78 14.3	+ 9 41.5	105 24.0	− 2 30.7	283 14.3	+ 3 11.8	108 01.7	146	− 2 00.7	+156
19	117 17.0	72 34.2	39.7	93 15.0	42.2	120 26.0	30.4	298 16.9	11.9	122 35.3	147	1 45.1	+157
20	132 19.5	87 33.6	40.7	108 15.7	42.9	135 27.9	30.2	313 19.6	12.0	137 09.0	147	1 29.4	+157
21	147 21.9	102 33.1	·· 41.6	123 16.4	·· 43.6	150 29.8	·· 30.0	328 22.2	·· 12.0	151 42.7	147	· 1 13.7	+156
22	162 24.4	117 32.6	42.6	138 17.1	44.3	165 31.7	29.7	343 24.8	12.1	166 16.4	147	0 58.1	+157
23	177 26.8	132 32.1	43.6	153 17.8	45.0	180 33.6	29.5	358 27.5	12.2	180 50.1	148	0 42.4	+156
0	192 29.3	147 31.6	+17 44.6	168 18.5	+ 9 45.7	195 35.6	− 2 29.3	13 30.1	+ 3 12.2	195 23.9	148	− 0 26.8	+156
1	207 31.8	162 31.0	45.5	183 19.2	46.4	210 37.5	29.0	28 32.7	12.3	209 57.7	148	− 0 11.2	+156
2	222 34.2	177 30.5	46.5	198 19.9	47.2	225 39.4	28.8	43 35.4	12.4	224 31.5	148	+ 0 04.4	+157
3	237 36.7	192 30.0	·· 47.5	213 20.6	·· 47.9	240 41.3	·· 28.6	58 38.0	·· 12.5	239 05.3	149	· 0 20.1	+156
4	252 39.2	207 29.5	48.4	228 21.3	48.6	255 43.2	28.3	73 40.6	12.5	253 39.2	148	0 35.7	+155
5	267 41.6	222 28.9	49.4	243 22.0	49.3	270 45.2	28.1	88 43.3	12.6	268 13.0	149	0 51.2	+156
6	282 44.1	237 28.4	+17 50.4	258 22.7	+ 9 50.0	285 47.1	− 2 27.9	103 45.9	+ 3 12.7	282 46.9	149	+ 1 06.8	+156
7	297 46.6	252 27.9	51.3	273 23.4	50.7	300 49.0	27.7	118 48.5	12.8	297 20.8	149	1 22.4	+155
8	312 49.0	267 27.4	52.3	288 24.1	51.4	315 50.9	27.4	133 51.2	12.8	311 54.7	149	1 37.9	+155
9	327 51.5	282 26.8	·· 53.3	303 24.8	·· 52.1	330 52.8	·· 27.2	148 53.8	·· 12.9	326 28.6	150	· 1 53.4	+155
10	342 54.0	297 26.3	54.2	318 25.5	52.8	345 54.8	27.0	163 56.4	13.0	341 02.6	149	2 08.9	+155
11	357 56.4	312 25.8	55.2	333 26.2	53.5	0 56.7	26.7	178 59.1	13.0	355 36.5	150	2 24.4	+154
12	12 58.9	327 25.3	+17 56.2	348 26.9	+ 9 54.2	15 58.6	− 2 26.5	194 01.7	+ 3 13.1	10 10.5	150	+ 2 39.8	+155
13	28 01.3	342 24.7	57.1	3 27.6	54.9	31 00.5	26.3	209 04.3	13.2	24 44.5	149	2 55.3	+154
14	43 03.8	357 24.2	58.1	18 28.3	55.6	46 02.4	26.0	224 07.0	13.3	39 18.4	150	3 10.7	+154
15	58 06.3	12 23.7	·17 59.0	33 29.0	·· 56.3	61 04.4	·· 25.8	239 09.6	·· 13.3	53 52.4	150	· 3 26.1	+153
16	73 08.7	27 23.2	18 00.0	48 29.7	57.0	76 06.3	25.6	254 12.2	13.4	68 26.4	150	3 41.4	+154
17	88 11.2	42 22.6	01.0	63 30.4	57.7	91 08.2	25.3	269 14.9	13.5	83 00.4	150	3 56.8	+153
18	103 13.7	57 22.1	+18 01.9	78 31.1	+ 9 58.4	106 10.1	− 2 25.1	284 17.5	+ 3 13.5	97 34.4	150	+ 4 12.1	+152
19	118 16.1	72 21.6	02.9	93 31.8	59.1	121 12.1	24.9	299 20.1	13.6	112 08.4	150	4 27.3	+153
20	133 18.6	87 21.0	03.8	108 32.5	9 59.8	136 14.0	24.6	314 22.8	13.7	126 42.4	150	4 42.6	+152
21	148 21.1	102 20.5	·· 04.8	123 33.2	·10 00.5	151 15.9	·· 24.4	329 25.4	·· 13.8	141 16.4	150	· 4 57.8	+152
22	163 23.5	117 20.0	05.7	138 33.9	01.2	166 17.8	24.2	344 28.0	13.8	155 50.4	150	5 13.0	+151
23	178 26.0	132 19.4	06.7	153 34.6	01.9	181 19.7	24.0	359 30.7	13.9	170 24.4	149	5 28.1	+152
0	193 28.4	147 18.9	+18 07.6	168 35.4	+10 02.6	196 21.7	− 2 23.7	14 33.3	+ 3 14.0	184 58.3	150	+ 5 43.3	+150
1	208 30.9	162 18.4	08.6	183 36.1	03.3	211 23.6	23.5	29 35.9	14.0	199 32.3	150	5 58.3	+151
2	223 33.4	177 17.8	09.6	198 36.8	04.0	226 25.5	23.3	44 38.6	14.1	214 06.3	150	6 13.4	+150
3	238 35.8	192 17.3	·· 10.5	213 37.5	·· 04.7	241 27.4	·· 23.0	59 41.2	·· 14.2	228 40.3	150	· 6 28.4	+150
4	253 38.3	207 16.8	11.5	228 38.2	05.4	256 29.4	22.8	74 43.8	14.2	243 14.3	149	6 43.4	+149
5	268 40.8	222 16.2	12.4	243 38.9	06.1	271 31.3	22.6	89 46.5	14.3	257 48.2	150	6 58.3	+149
6	283 43.2	237 15.7	+18 13.4	258 39.6	+10 06.8	286 33.2	− 2 22.3	104 49.1	+ 3 14.4	272 22.2	149	+ 7 13.2	+149
7	298 45.7	252 15.2	14.3	273 40.3	07.5	301 35.1	22.1	119 51.7	14.5	286 56.1	149	7 28.1	+148
8	313 48.2	267 14.6	15.2	288 41.0	08.2	316 37.0	21.9	134 54.4	14.5	301 30.0	150	7 42.9	+147
9	328 50.6	282 14.1	·· 16.2	303 41.7	·· 08.9	331 39.0	·· 21.6	149 57.0	·· 14.6	316 04.0	149	· 7 57.6	+148
10	343 53.1	297 13.6	17.1	318 42.4	09.6	346 40.9	21.4	164 59.6	14.7	330 37.9	149	8 12.4	+14[illegible]
11	358 55.6	312 13.0	18.1	333 43.1	10.3	1 42.8	21.2	180 02.3	14.7	345 11.8	148	8 27.0	+147
12	13 58.0	327 12.5	+18 19.0	348 43.8	+10 11.0	16 44.7	− 2 21.0	195 04.9	+ 3 14.8	359 45.6	149	+ 8 41.7	+146
13	29 00.5	342 12.0	20.0	3 44.5	11.7	31 46.7	20.7	210 07.5	14.9	14 19.5	149	8 56.3	+145
14	44 02.9	357 11.4	20.9	18 45.2	12.4	46 48.6	20.5	225 10.1	15.0	28 53.4	148	9 10.8	+145
15	59 05.4	12 10.9	·· 21.9	33 45.9	·· 13.1	61 50.5	·· 20.3	240 12.8	·· 15.0	43 27.2	148	· 9 25.3	+144
16	74 07.9	27 10.3	22.8	48 46.6	13.8	76 52.4	20.0	255 15.4	15.1	58 01.0	148	9 39.7	+144
17	89 10.3	42 09.8	23.7	63 47.3	14.5	91 54.3	19.8	270 18.0	15.2	72 34.8	148	9 54.1	+144
18	104 12.8	57 09.3	+18 24.7	78 48.0	+10 15.2	106 56.3	− 2 19.6	285 20.7	+ 3 15.2	87 08.6	147	+10 08.5	+143
19	119 15.3	72 08.7	25.6	93 48.7	15.9	121 58.2	19.3	300 23.3	15.3	101 42.3	147	10 22.8	+142
20	134 17.7	87 08.2	26.5	108 49.4	16.6	137 00.1	19.1	315 25.9	15.4	116 16.0	147	10 37.0	+142
21	149 20.2	102 07.6	·· 27.5	123 50.1	·· 17.3	152 02.0	·· 18.9	330 28.6	·· 15.4	130 49.7	147	·10 51.2	+141
22	164 22.7	117 07.1	28.4	138 50.8	18.0	167 04.0	18.6	345 31.2	15.5	145 23.4	147	11 05.3	+141
23	179 25.1	132 06.6	29.4	153 51.5	18.7	182 05.9	18.4	0 33.8	15.6	159 57.1	146	11 19.4	+140
24	194 27.6	147 06.0	+18 30.3	168 52.2	+10 19.4	197 07.8	− 2 18.2	15 36.5	+ 3 15.7	174 30.7	146	+11 33.4	+139
code	—	− 6	+ 9	+ 7	+ 7	+ 19	+ 2	+ 26	+ 1				

GCT	SUN GHA	SUN Dec.
h	° ′	° ′
0	179 09.6	+ 5 17.9
1	194 09.8	18.8
2	209 09.9	19.8
3	224 10.1	·· 20.7
4	239 10.3	21.7
5	254 10.5	22.7
6	269 10.7	+ 5 23.6
7	284 10.9	24.6
8	299 11.0	25.5
9	314 11.2	·· 26.5
10	329 11.4	27.4
11	344 11.6	28.4
12	359 11.8	+ 5 29.4
13	14 12.0	30.3
14	29 12.1	31.3
15	44 12.3	·· 32.2
16	59 12.5	33.2
17	74 12.7	34.1
18	89 12.9	+ 5 35.1
19	104 13.1	36.0
20	119 13.2	37.0
21	134 13.4	·· 38.0
22	149 13.6	38.9
23	164 13.8	39.9
0	179 14.0	+ 5 40.8
1	194 14.2	41.8
2	209 14.3	42.7
3	224 14.5	·· 43.7
4	239 14.7	44.6
5	254 14.9	45.6
6	269 15.1	+ 5 46.5
7	284 15.2	47.5
8	299 15.4	48.4
9	314 15.6	·· 49.4
10	329 15.8	50.3
11	344 16.0	51.3
12	359 16.2	+ 5 52.3
13	14 16.3	53.2
14	29 16.5	54.2
15	44 16.7	·· 55.1
16	59 16.9	56.1
17	74 17.1	57.0
18	89 17.2	+ 5 58.0
19	104 17.4	58.9
20	119 17.6	5 59.9
21	134 17.8	· 6 00.8
22	149 18.0	01.8
23	164 18.1	02.7
0	179 18.3	+ 6 03.7
1	194 18.5	04.6
2	209 18.7	05.6
3	224 18.9	·· 06.5
4	239 19.0	07.5
5	254 19.2	08.4
6	269 19.4	+ 6 09.4
7	284 19.6	10.3
8	299 19.8	11.3
9	314 19.9	·· 12.2
10	329 20.1	13.2
11	344 20.3	14.1
12	359 20.5	+ 6 15.0
13	14 20.7	16.0
14	29 20.8	16.9
15	44 21.0	·· 17.9
16	59 21.2	18.8
17	74 21.4	19.8
18	89 21.6	+ 6 20.7
19	104 21.7	21.7
20	119 21.9	22.6
21	134 22.1	·· 23.6
22	149 22.3	24.5
23	164 22.4	25.5
24	179 22.6	+ 6 26.4
code	—	+ 9

STARS No.	SHA	Dec.	Transit Mer. Gr.
	° ′	° ′	h m
1	358 32.4	+28 49.2	11 14
2	358 22.4	+58 52.8	11 15
3	349 43.1	−18 15.3	11 49
4	339 21.7	+59 59.0	12 31
5	336 01.8	−57 29.1	12 44
6	333 01.5	+89 02.2	12 56
7	328 54.0	+23 14.0	13 12
8	315 54.1	−40 30.0	14 04
9	309 48.0	+49 41.6	14 28
10	291 43.4	+16 24.9	15 41
11	281 57.2	− 8 15.4	16 20
12	281 43.9	+45 57.3	16 20
13	279 22.4	+ 6 18.5	16 30
14	279 12.0	+28 34.3	16 31
15	276 34.0	− 1 13.9	16 41
16	271 52.1	+ 7 24.0	17 00
17	264 17.1	−52 40.3	17 30
18	259 15.0	−16 38.9	17 50
19	255 49.4	−28 54.4	18 04
20	245 48.7	+ 5 21.1	18 44
21	244 24.8	+28 08.9	18 49
22	234 37.2	−59 21.3	19 28
23	223 26.8	−43 14.3	20 13
24	221 49.7	−69 31.2	20 19
25	218 41.9	− 8 26.9	20 32
26	208 33.0	+12 12.3	21 12
27	194 48.0	+62 01.0	22 07
28	183 21.0	+14 50.6	22 53
29	174 01.4	−62 49.9	23 30
30	172 52.9	−56 50.6	23 35
31	168 46.7	−59 25.5	23 51
32	167 00.8	+56 13.3	0 02
33	159 29.7	+55 10.6	0 32
34	159 20.3	−10 54.6	0 33
35	153 35.0	+49 33.1	0 56
36	149 02.6	−36 08.0	1 14
37	146 38.0	+19 25.9	1 23
38	140 55.5	−60 38.3	1 46
39	137 16.2	+74 21.0	2 01
40	126 50.3	+26 52.3	2 42
41	120 38.0	−22 29.3	3 07
42	113 23.5	−26 19.7	3 36
43	109 07.3	−68 56.4	3 53
44	103 06.1	−15 40.2	4 17
45	97 25.4	−37 04.3	4 40
46	96 49.8	+12 35.3	4 42
47	91 07.7	+51 29.2	5 05
48	84 45.8	−34 24.7	5 30
49	81 10.6	+38 43.8	5 44
50	76 56.3	−26 21.7	6 01
51	62 54.0	+ 8 44.0	6 57
52	54 32.9	−56 53.5	7 31
53	50 03.7	+45 05.9	7 49
54	34 33.3	+ 9 38.8	8 50
55	28 42.6	−47 11.9	9 14
56	16 15.7	−29 52.9	10 03
57	14 25.3	+14 56.4	10 11

Lat.	Sunrise	Twlt. begins	Moonrise 4	5	6	7
N °	h m	h m	h m	h m	h m	h m
70	4 48	////	5 26	4 59	4 32	4 01
68	4 55	////	5 20	5 00	4 40	4 17
66	5 02	0 39	5 15	5 01	4 46	4 31
64	5 07	1 42	5 11	5 01	4 52	4 42
62	5 12	2 13	5 07	5 02	4 57	4 52
60	5 16	2 35	5 04	5 02	5 01	5 00
58	5 19	2 52	5 01	5 03	5 05	5 07
56	5 22	3 06	4 58	5 03	5 08	5 14
54	5 25	3 17	4 56	5 03	5 11	5 19
52	5 28	3 28	4 54	5 04	5 14	5 25
50	5 30	3 36	4 52	5 04	5 16	5 29
45	5 35	3 54	4 47	5 04	5 22	5 40
40	5 39	4 07	4 43	5 05	5 26	5 49
35	5 42	4 17	4 40	5 05	5 30	5 56
30	5 46	4 26	4 38	5 06	5 34	6 03
20	5 51	4 38	4 33	5 07	5 40	6 14
10	5 55	4 46	4 28	5 07	5 45	6 24
0	6 00	4 51	4 24	5 08	5 51	6 34
10	6 04	4 54	4 20	5 08	5 56	6 44
20	6 08	4 55	4 16	5 09	6 02	6 54
30	6 13	4 53	4 11	5 10	6 08	7 06
35	6 15	4 50	4 08	5 11	6 12	7 13
40	6 18	4 47	4 05	5 11	6 16	7 21
45	6 22	4 43	4 01	5 12	6 21	7 30
50	6 26	4 37	3 57	5 13	6 27	7 42
52	6 28	4 34	3 55	5 13	6 30	7 47
54	6 30	4 30	3 52	5 13	6 33	7 53
56	6 32	4 26	3 50	5 14	6 37	8 00
58	6 34	4 21	3 47	5 14	6 41	8 07
60	6 37	4 15	3 44	5 15	6 45	8 15
S						

Lat.	Sunset	Twlt. ends	Moonset 4	5	6	7
N °	h m	h m	h m	h m	h m	h m
70	19 21	////	16 16	18 16	20 19	22 39
68	19 13	////	16 19	18 11	20 04	22 08
66	19 06	////	16 22	18 07	19 53	21 44
64	19 01	22 36	16 24	18 04	19 43	21 26
62	18 56	22 01	16 26	18 01	19 35	21 12
60	18 52	21 38	16 27	17 58	19 28	20 59
58	18 48	21 19	16 29	17 56	19 22	20 49
56	18 45	21 05	16 30	17 54	19 16	20 39
54	18 42	20 53	16 31	17 52	19 11	20 31
52	18 39	20 42	16 32	17 50	19 07	20 24
50	18 37	20 33	16 33	17 49	19 03	20 18
45	18 32	20 15	16 35	17 45	18 54	20 04
40	18 28	20 02	16 37	17 43	18 47	19 52
35	18 24	19 51	16 38	17 40	18 41	19 43
30	18 21	19 42	16 40	17 38	18 36	19 34
20	18 15	19 29	16 42	17 34	18 27	19 20
10	18 11	19 21	16 44	17 31	18 19	19 07
0	18 06	19 15	16 45	17 28	18 11	18 55
10	18 02	19 12	16 47	17 25	18 04	18 43
20	17 58	19 11	16 49	17 22	17 56	18 31
30	17 53	19 12	16 51	17 19	17 47	18 17
35	17 50	19 14	16 52	17 17	17 42	18 09
40	17 47	19 17	16 53	17 14	17 36	17 59
45	17 43	19 20	16 55	17 12	17 29	17 48
50	17 39	19 26	16 56	17 08	17 21	17 35
52	17 37	19 29	16 57	17 07	17 17	17 29
54	17 35	19 33	16 58	17 05	17 13	17 23
56	17 33	19 37	16 59	17 04	17 09	17 15
58	17 31	19 42	17 00	17 02	17 04	17 07
60	17 28	19 47	17 01	17 00	16 58	16 57
S						

GCT	Equation of Time (App.—Mean) 4	5	6
h	m s	m s	m s
0	− 3 22.1	− 3 04.5	− 2 47.1
6	− 3 17.7	− 3 00.1	− 2 42.8
12	− 3 13.3	− 2 55.8	− 2 38.4
18	− 3 08.9	− 2 51.4	− 2 34.1
24	− 3 04.5	− 2 47.1	− 2 29.9

GCT of Transit Meridian of Greenwich

DAY	Moon	Venus	Mars	Jupiter	Saturn
	h m	h m	h m	h m	h m
4	10 35	14 10	12 47	10 59	23 06
5	11 18	14 10	12 46	10 56	23 02
6	12 01	14 11	12 45	10 53	22 58
7	12 45	14 12	12 44	10 50	22 54

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb	Venus	Mars
°	′	′	′
0–30	0.3	0.1	0.1
30–45	0.3	0.1	0.0
45–60	0.3	0.1	0.0
60–75	0.3	0.0	0.0
75–90	0.3	0.0	0.0

Moon's Lower Limb

Add

Alt.	4	5	6
°	′	′	′
0–4	15.6	14.9	14.3
4–8	15.6	14.9	14.3
8–12	15.6	14.9	14.3
12–16	15.6	14.9	14.3
16–20	15.6	14.9	14.3
20–24	15.6	15.0	14.4
24–28	15.6	15.0	14.4
28–32	15.6	15.0	14.4
32–36	15.6	15.0	14.4
36–40	15.6	15.0	14.5
40–44	15.6	15.0	14.5
44–48	15.6	15.1	14.6
48–52	15.6	15.1	14.6
52–56	15.6	15.1	14.7
56–60	15.6	15.1	14.7
60–64	15.6	15.2	14.8
64–68	15.6	15.2	14.9
68–72	15.6	15.2	14.9
72–76	15.6	15.3	15.0
76–80	15.6	15.3	15.1
80–84	15.6	15.3	15.1
84–88	15.6	15.4	15.2
88–90	15.6	15.4	15.3

Add to table, back cover

Moon's Upper Limb

Subtract

Alt.	4	5	6
°	′	′	′
0–4	15.6	15.9	16.3
4–8	15.6	15.9	16.3
8–12	15.6	15.9	16.3
12–16	15.6	15.9	16.2
16–20	15.6	15.9	16.2
20–24	15.6	15.9	16.2
24–28	15.6	15.9	16.2
28–32	15.6	15.8	16.1
32–36	15.6	15.8	16.1
36–40	15.6	15.8	16.1
40–44	15.6	15.8	16.0
44–48	15.6	15.8	16.0
48–52	15.6	15.7	15.9
52–56	15.6	15.7	15.9
56–60	15.6	15.7	15.8
60–64	15.6	15.6	15.7
64–68	15.6	15.6	15.7
68–72	15.6	15.6	15.6
72–76	15.6	15.6	15.6
76–80	15.6	15.5	15.5
80–84	15.6	15.5	15.4
84–88	15.6	15.4	15.3
88–90	15.6	15.4	15.3

Subtract from table, back cover

New Moon 6

GCT	♈ GHA	VENUS −3.4 GHA	Dec.	MARS 1.5 GHA	Dec.	JUPITER −1.6 GHA	Dec.	SATURN 0.8 GHA	Dec.	MOON GHA	code	Dec.	code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
0	194 27.6	147 06.0	+18 30.3	168 52.2	+10 19.4	197 07.8	− 2 18.2	15 36.5	+ 3 15.7	174 30.7	146	+11 33.4	+139
1	209 30.0	162 05.5	31.2	183 52.9	20.1	212 09.7	18.0	30 39.1	15.7	189 04.3	146	11 47.3	+139
2	224 32.5	177 04.9	32.2	198 53.6	20.8	227 11.7	17.7	45 41.7	15.8	203 37.9	145	12 01.2	+138
3	239 35.0	192 04.4	·· 33.1	213 54.3	·· 21.5	242 13.6	·· 17.5	60 44.4	·· 15.9	218 11.4	146	·12 15.0	+138
4	254 37.4	207 03.8	34.0	228 55.0	22.2	257 15.5	17.3	75 47.0	15.9	232 45.0	145	12 28.8	+137
5	269 39.9	222 03.3	34.9	243 55.7	22.9	272 17.4	17.0	90 49.6	16.0	247 18.5	144	12 42.5	+137
6	284 42.4	237 02.8	+18 35.9	258 56.4	+10 23.6	287 19.3	− 2 16.8	105 52.2	+ 3 16.1	261 51.9	145	+12 56.2	+135
7	299 44.8	252 02.2	36.8	273 57.1	24.3	302 21.3	16.6	120 54.9	16.1	276 25.4	144	13 09.7	+136
8	314 47.3	267 01.7	37.7	288 57.8	25.0	317 23.2	16.3	135 57.5	16.2	290 58.8	143	13 23.3	+134
9	329 49.8	282 01.1	·· 38.7	303 58.5	·· 25.7	332 25.1	·· 16.1	151 00.1	·· 16.3	305 32.1	144	·13 36.7	+134
10	344 52.2	297 00.6	39.6	318 59.2	26.3	347 27.0	15.9	166 02.8	16.4	320 05.5	143	13 50.1	+133
11	359 54.7	312 00.0	40.5	333 59.9	27.0	2 29.0	15.7	181 05.4	16.4	334 38.8	142	14 03.4	+132
12	14 57.2	326 59.5	+18 41.4	349 00.6	+10 27.7	17 30.9	− 2 15.4	196 08.0	+ 3 16.5	349 12.0	143	+14 16.6	+132
13	29 59.6	341 58.9	42.4	4 01.3	28.4	32 32.8	15.2	211 10.7	16.6	3 45.3	142	14 29.8	+131
14	45 02.1	356 58.4	43.3	19 02.0	29.1	47 34.7	15.0	226 13.3	16.6	18 18.5	141	14 42.9	+131
15	60 04.5	11 57.8	·· 44.2	34 02.7	·· 29.8	62 36.7	·· 14.7	241 15.9	·· 16.7	32 51.6	141	·14 56.0	+129
16	75 07.0	26 57.3	45.1	49 03.4	30.5	77 38.6	14.5	256 18.6	16.8	47 24.7	141	15 08.9	+129
17	90 09.5	41 56.7	46.0	64 04.1	31.2	92 40.5	14.3	271 21.2	16.8	61 57.8	141	15 21.8	+128
18	105 11.9	56 56.2	+18 47.0	79 04.8	+10 31.9	107 42.4	− 2 14.0	286 23.8	+ 3 16.9	76 30.9	140	+15 34.6	+128
19	120 14.4	71 55.6	47.9	94 05.5	32.6	122 44.4	13.8	301 26.4	17.0	91 03.9	140	15 47.4	+126
20	135 16.9	86 55.1	48.8	109 06.2	33.3	137 46.3	13.6	316 29.1	17.1	105 36.9	139	16 00.0	+126
21	150 19.3	101 54.5	·· 49.7	124 06.9	·· 34.0	152 48.2	·· 13.4	331 31.7	·· 17.1	120 09.8	139	·16 12.6	+125
22	165 21.8	116 54.0	50.6	139 07.6	34.7	167 50.1	13.1	346 34.3	17.2	134 42.7	138	16 25.1	+125
23	180 24.3	131 53.4	51.5	154 08.3	35.4	182 52.1	12.9	1 37.0	17.3	149 15.5	138	16 37.6	+123
0	195 26.7	146 52.9	+18 52.5	169 09.0	+10 36.1	197 54.0	− 2 12.7	16 39.6	+ 3 17.3	163 48.3	138	+16 49.9	+123
1	210 29.2	161 52.3	53.4	184 09.7	36.7	212 55.9	12.4	31 42.2	17.4	178 21.1	137	17 02.2	+122
2	225 31.7	176 51.8	54.3	199 10.4	37.4	227 57.8	12.2	46 44.8	17.5	192 53.8	137	17 14.4	+121
3	240 34.1	191 51.2	·· 55.2	214 11.1	·· 38.1	242 59.8	·· 12.0	61 47.5	·· 17.5	207 26.5	136	·17 26.5	+120
4	255 36.6	206 50.7	56.1	229 11.8	38.8	258 01.7	11.7	76 50.1	17.6	221 59.1	136	17 38.5	+120
5	270 39.0	221 50.1	57.0	244 12.5	39.5	273 03.6	11.5	91 52.7	17.7	236 31.7	135	17 50.5	+118
6	285 41.5	236 49.6	+18 57.9	259 13.2	+10 40.2	288 05.5	− 2 11.3	106 55.4	+ 3 17.7	251 04.2	135	+18 02.3	+118
7	300 44.0	251 49.0	58.8	274 13.9	40.9	303 07.5	11.1	121 58.0	17.8	265 36.7	135	18 14.1	+117
8	315 46.4	266 48.5	18 59.8	289 14.6	41.6	318 09.4	10.8	137 00.6	17.9	280 09.2	134	18 25.8	+116
9	330 48.9	281 47.9	·19 00.7	304 15.3	·· 42.3	333 11.3	·· 10.6	152 03.3	·· 17.9	294 41.6	133	·18 37.4	+115
10	345 51.4	296 47.4	01.6	319 16.0	43.0	348 13.2	10.4	167 05.9	18.0	309 13.9	133	18 48.9	+114
11	0 53.8	311 46.8	02.5	334 16.7	43.7	3 15.2	10.1	182 08.5	18.1	323 46.2	133	19 00.3	+113
12	15 56.3	326 46.2	+19 03.4	349 17.4	+10 44.3	18 17.1	− 2 09.9	197 11.1	+ 3 18.2	338 18.5	132	+19 11.6	+113
13	30 58.8	341 45.7	04.3	4 18.1	45.0	33 19.0	09.7	212 13.8	18.2	352 50.7	132	19 22.9	+111
14	46 01.2	356 45.1	05.2	19 18.8	45.7	48 20.9	09.5	227 16.4	18.3	7 22.9	131	19 34.0	+111
15	61 03.7	11 44.6	·· 06.1	34 19.5	·· 46.4	63 22.9	·· 09.2	242 19.0	·· 18.4	21 55.0	131	·19 45.1	+110
16	76 06.1	26 44.0	07.0	49 20.2	47.1	78 24.8	09.0	257 21.7	18.4	36 27.1	130	19 56.1	+108
17	91 08.6	41 43.5	07.9	64 20.9	47.8	93 26.7	08.8	272 24.3	18.5	50 59.1	130	20 06.9	+108
18	106 11.1	56 42.9	+19 08.8	79 21.6	+10 48.5	108 28.6	− 2 08.5	287 26.9	+ 3 18.6	65 31.1	129	+20 17.7	+107
19	121 13.5	71 42.3	09.7	94 22.3	49.2	123 30.6	08.3	302 29.5	18.6	80 03.0	128	20 28.4	+106
20	136 16.0	86 41.8	10.6	109 23.0	49.9	138 32.5	08.1	317 32.2	18.7	94 34.8	129	20 39.0	+104
21	151 18.5	101 41.2	·· 11.5	124 23.7	·· 50.5	153 34.4	·· 07.8	332 34.8	·· 18.8	109 06.7	127	·20 49.4	+104
22	166 20.9	116 40.7	12.4	139 24.4	51.2	168 36.3	07.6	347 37.4	18.8	123 38.4	127	20 59.8	+103
23	181 23.4	131 40.1	13.3	154 25.1	51.9	183 38.3	07.4	2 40.0	18.9	138 10.1	127	21 10.1	+102
0	196 25.9	146 39.5	+19 14.2	169 25.8	+10 52.6	198 40.2	− 2 07.2	17 42.7	+ 3 19.0	152 41.8	126	+21 20.3	+101
1	211 28.3	161 39.0	15.1	184 26.5	53.3	213 42.1	06.9	32 45.3	19.0	167 13.4	126	21 30.4	+100
2	226 30.8	176 38.4	16.0	199 27.1	54.0	228 44.0	06.7	47 47.9	19.1	181 45.0	125	21 40.4	+ 99
3	241 33.3	191 37.8	·· 16.8	214 27.8	·· 54.7	243 46.0	·· 06.5	62 50.6	·· 19.2	196 16.5	125	·21 50.3	+ 98
4	256 35.7	206 37.3	17.7	229 28.5	55.3	258 47.9	06.2	77 53.2	19.2	210 48.0	124	22 00.1	+ 96
5	271 38.2	221 36.7	18.6	244 29.2	56.0	273 49.8	06.0	92 55.8	19.3	225 19.4	124	22 09.7	+ 96
6	286 40.6	236 36.2	+19 19.5	259 29.9	+10 56.7	288 51.7	− 2 05.8	107 58.4	+ 3 19.4	239 50.8	123	+22 19.3	+ 95
7	301 43.1	251 35.6	20.4	274 30.6	57.4	303 53.7	05.6	123 01.1	19.5	254 22.1	122	22 28.8	+ 93
8	316 45.6	266 35.0	21.3	289 31.3	58.1	318 55.6	05.3	138 03.7	19.5	268 53.3	122	22 38.1	+ 93
9	331 48.0	281 34.5	·· 22.2	304 32.0	·· 58.8	333 57.5	·· 05.1	153 06.3	·· 19.6	283 24.5	122	·22 47.4	+ 91
10	346 50.5	296 33.9	23.1	319 32.7	10 59.5	348 59.4	04.9	168 09.0	19.7	297 55.7	121	22 56.5	+ 91
11	1 53.0	311 33.3	23.9	334 33.4	11 00.1	4 01.4	04.6	183 11.6	19.7	312 26.8	121	23 05.6	+ 89
12	16 55.4	326 32.8	+19 24.8	349 34.1	+11 00.8	19 03.3	− 2 04.4	198 14.2	+ 3 19.8	326 57.9	120	+23 14.5	+ 88
13	31 57.9	341 32.2	25.7	4 34.8	01.5	34 05.2	04.2	213 16.8	19.9	341 28.9	119	23 23.3	+ 87
14	47 00.4	356 31.6	26.6	19 35.5	02.2	49 07.1	04.0	228 19.5	19.9	355 59.8	119	23 32.0	+ 86
15	62 02.8	11 31.1	·· 27.5	34 36.2	·· 02.9	64 09.1	·· 03.7	243 22.1	·· 20.0	10 30.7	119	·23 40.6	+ 85
16	77 05.3	26 30.5	28.4	49 36.9	03.6	79 11.0	03.5	258 24.7	20.1	25 01.6	118	23 49.1	+ 84
17	92 07.7	41 29.9	29.2	64 37.6	04.2	94 12.9	03.3	273 27.3	20.1	39 32.4	117	23 57.5	+ 83
18	107 10.2	56 29.4	+19 30.1	79 38.3	+11 04.9	109 14.9	− 2 03.0	288 30.0	+ 3 20.2	54 03.1	117	+24 05.8	+ 81
19	122 12.7	71 28.8	31.0	94 39.0	05.6	124 16.8	02.8	303 32.6	20.3	68 33.8	117	24 13.9	+ 80
20	137 15.1	86 28.2	31.9	109 39.7	06.3	139 18.7	02.6	318 35.2	20.3	83 04.5	116	24 21.9	+ 80
21	152 17.6	101 27.7	·· 32.8	124 40.4	·· 07.0	154 20.6	·· 02.4	333 37.8	·· 20.4	97 35.1	115	·24 29.9	+ 78
22	167 20.1	116 27.1	33.6	139 41.1	07.7	169 22.6	02.1	348 40.5	20.5	112 05.6	115	24 37.7	+ 77
23	182 22.5	131 26.5	34.5	154 41.8	08.3	184 24.5	01.9	3 43.1	20.5	126 36.1	115	24 45.4	+ 75
24	197 25.0	146 25.9	+19 35.4	169 42.5	+11 09.0	199 26.4	− 2 01.7	18 45.7	+ 3 20.6	141 06.6	114	+24 52.9	+ 75
code	—	− 5	+ 9	+ 7	+ 7	+ 19	+ 2	+ 27	0				

SUN

GCT (h)	GHA (° ′)	Dec. (° ′)
0	179 22.6	+ 6 26.4
1	194 22.8	27.3
2	209 23.0	28.3
3	224 23.2 ··	29.2
4	239 23.3	30.2
5	254 23.5	31.1
6	269 23.7	+ 6 32.1
7	284 23.9	33.0
8	299 24.1	34.0
9	314 24.2 ··	34.9
10	329 24.4	35.8
11	344 24.6	36.8
12	359 24.8	+ 6 37.7
13	14 24.9	38.7
14	29 25.1	39.6
15	44 25.3 ··	40.6
16	59 25.5	41.5
17	74 25.6	42.4
18	89 25.8	+ 6 43.4
19	104 26.0	44.3
20	119 26.2	45.3
21	134 26.4 ··	46.2
22	149 26.5	47.2
23	164 26.7	48.1
0	179 26.9	+ 6 49.0
1	194 27.1	50.0
2	209 27.2	50.9
3	224 27.4 ··	51.9
4	239 27.6	52.8
5	254 27.8	53.7
6	269 27.9	+ 6 54.7
7	284 28.1	55.6
8	299 28.3	56.5
9	314 28.5 ··	57.5
10	329 28.6	58.4
11	344 28.8	6 59.4
12	359 29.0	+ 7 00.3
13	14 29.2	01.2
14	29 29.3	02.2
15	44 29.5 ··	03.1
16	59 29.7	04.1
17	74 29.9	05.0
18	89 30.0	+ 7 05.9
19	104 30.2	06.9
20	119 30.4	07.8
21	134 30.6 ··	08.7
22	149 30.7	09.7
23	164 30.9	10.6
0	179 31.1	+ 7 11.5
1	194 31.3	12.5
2	209 31.4	13.4
3	224 31.6 ··	14.4
4	239 31.8	15.3
5	254 32.0	16.2
6	269 32.1	+ 7 17.2
7	284 32.3	18.1
8	299 32.5	19.0
9	314 32.6 ··	20.0
10	329 32.8	20.9
11	344 33.0	21.8
12	359 33.2	+ 7 22.8
13	14 33.3	23.7
14	29 33.5	24.6
15	44 33.7 ··	25.6
16	59 33.9	26.5
17	74 34.0	27.4
18	89 34.2	+ 7 28.3
19	104 34.4	29.3
20	119 34.5	30.2
21	134 34.7 ··	31.1
22	149 34.9	32.1
23	164 35.1	33.0
24	179 35.2	+ 7 33.9
code	—	+ 9

STARS

No.	SHA (° ′)	Dec. (° ′)	Transit Mer. Gr. (h m)
1	358 32.4	+28 49.2	11 02
2	358 22.3	+58 52.7	11 03
3	349 43.1	−18 15.3	11 37
4	339 21.7	+59 59.0	12 19
5	336 01.8	−57 29.0	12 32
6	333 01.6	+89 02.2	12 44
7	328 54.0	+23 14.0	13 00
8	315 54.1	−40 30.0	13 52
9	309 48.0	+49 41.5	14 17
10	291 43.4	+16 24.9	15 29
11	281 57.2	− 8 15.4	16 08
12	281 43.9	+45 57.3	16 09
13	279 22.4	+ 6 18.5	16 18
14	279 12.0	+28 34.3	16 19
15	276 34.0	− 1 13.9	16 29
16	271 52.1	+ 7 24.0	16 48
17	264 17.1	−52 40.3	17 18
18	259 15.0	−16 38.9	17 38
19	255 49.4	−28 54.4	17 52
20	245 48.7	+ 5 21.1	18 32
21	244 24.8	+28 08.9	18 38
22	234 37.2	−59 21.3	19 17
23	223 26.9	−43 14.3	20 01
24	221 49.7	−69 31.2	20 08
25	218 41.9	− 8 26.9	20 20
26	208 33.0	+12 12.4	21 01
27	194 48.1	+62 01.0	21 55
28	183 21.0	+14 50.6	22 41
29	174 01.4	−62 49.9	23 18
30	172 52.9	−56 50.6	23 23
31	168 46.7	−59 25.5	23 39
32	167 00.8	+56 13.3	23 46
33	159 29.7	+55 10.6	0 20
34	159 20.3	−10 54.6	0 21
35	153 35.0	+49 33.2	0 44
36	149 02.6	−36 08.0	1 02
37	146 38.0	+19 25.9	1 11
38	140 55.5	−60 38.3	1 34
39	137 16.2	+74 21.0	1 49
40	126 50.3	+26 52.3	2 30
41	120 38.0	−22 29.3	2 55
42	113 23.5	−26 19.7	3 24
43	109 07.2	−68 56.4	3 41
44	103 06.1	−15 40.2	4 05
45	97 25.3	−37 04.3	4 28
46	96 49.7	+12 35.3	4 30
47	91 07.7	+51 29.2	4 53
48	84 45.8	−34 24.7	5 18
49	81 10.6	+38 43.8	5 33
50	76 56.2	−26 21.7	5 50
51	62 53.9	+ 8 44.0	6 46
52	54 32.9	−56 53.5	7 19
53	50 03.7	+45 05.9	7 37
54	34 33.3	+ 9 38.8	8 39
55	28 42.5	−47 11.8	9 02
56	16 15.7	−29 52.9	9 52
57	14 25.3	+14 56.4	9 59

Sunrise, Twilight, Moonrise

Lat. (°)	Sunrise (h m)	Twlt. begins (h m)	Moonrise 7 (h m)	Moonrise 8 (h m)	Moonrise 9 (h m)	Moonrise 10 (h m)
N 70	4 34	////	4 01	3 13	▭	▭
68	4 43	////	4 17	3 47	2 35	▭
66	4 50	////	4 31	4 11	3 39	▭
64	4 56	1 12	4 42	4 30	4 14	3 42
62	5 02	1 53	4 52	4 46	4 40	4 33
60	5 07	2 20	5 00	4 59	5 00	5 04
58	5 11	2 39	5 07	5 11	5 17	5 28
56	5 14	2 55	5 14	5 21	5 31	5 47
54	5 18	3 08	5 19	5 30	5 44	6 04
52	5 21	3 19	5 25	5 38	5 55	6 17
50	5 23	3 29	5 29	5 45	6 04	6 30
45	5 29	3 47	5 40	6 00	6 25	6 55
40	5 34	4 02	5 49	6 13	6 41	7 15
35	5 38	4 13	5 56	6 24	6 56	7 32
30	5 42	4 21	6 03	6 34	7 08	7 47
20	5 48	4 35	6 14	6 50	7 29	8 12
10	5 54	4 43	6 24	7 05	7 48	8 33
0	5 59	4 50	6 34	7 19	8 05	8 54
10	6 04	4 54	6 44	7 32	8 23	9 14
20	6 09	4 55	6 54	7 47	8 41	9 36
30	6 14	4 55	7 06	8 04	9 03	10 02
35	6 18	4 53	7 13	8 14	9 16	10 17
40	6 21	4 50	7 21	8 26	9 31	10 34
45	6 25	4 47	7 30	8 40	9 49	10 56
50	6 30	4 42	7 42	8 57	10 11	11 22
52	6 33	4 39	7 47	9 05	10 21	11 36
54	6 35	4 35	7 53	9 13	10 33	11 51
56	6 38	4 32	8 00	9 23	10 47	12 09
58	6 41	4 28	8 07	9 35	11 04	12 31
60	6 44	4 23	8 15	9 48	11 23	12 59
S						

Sunset, Twilight, Moonset

Lat. (°)	Sunset (h m)	Twlt. ends (h m)	Moonset 7 (h m)	Moonset 8 (h m)	Moonset 9 (h m)	Moonset 10 (h m)
N 70	19 33	////	22 39	▭	▭	▭
68	19 24	////	22 08	24 54	0 54	▭
66	19 16	////	21 44	23 52	▭	▭
64	19 10	23 06	21 26	23 17	25 29	1 29
62	19 04	22 19	21 12	22 53	24 39	0 39
60	18 59	21 51	20 59	22 33	24 08	0 08
58	18 55	21 31	20 49	22 17	23 45	25 09
56	18 51	21 14	20 39	22 03	23 26	24 44
54	18 48	21 01	20 31	21 52	23 11	24 25
52	18 44	20 49	20 24	21 41	22 57	24 09
50	18 42	20 40	20 18	21 32	22 46	23 54
45	18 36	20 20	20 04	21 13	22 21	23 26
40	18 31	20 06	19 52	20 57	22 02	23 04
35	18 26	19 53	19 43	20 44	21 45	22 45
30	18 22	19 44	19 34	20 33	21 31	22 29
20	18 16	19 31	19 20	20 13	21 08	22 02
10	18 10	19 21	19 07	19 56	20 47	21 39
0	18 05	19 14	18 55	19 41	20 28	21 18
10	18 00	19 10	18 43	19 25	20 09	20 56
20	17 55	19 08	18 31	19 08	19 49	20 33
30	17 49	19 08	18 17	18 49	19 26	20 07
35	17 46	19 10	18 09	18 38	19 12	19 51
40	17 42	19 12	17 59	18 26	18 56	19 33
45	17 38	19 15	17 48	18 11	18 38	19 11
50	17 33	19 20	17 35	17 53	18 15	18 44
52	17 31	19 23	17 29	17 44	18 03	18 30
54	17 28	19 26	17 23	17 35	17 51	18 15
56	17 25	19 29	17 15	17 24	17 36	17 56
58	17 22	19 33	17 07	17 12	17 20	17 34
60	17 19	19 38	16 57	16 58	16 59	17 05
S						

Equation of Time (App.—Mean)

GCT (h)	7 (m s)	8 (m s)	9 (m s)
0	− 2 29.9	− 2 12.8	− 1 56.0
6	− 2 25.6	− 2 08.6	− 1 51.8
12	− 2 21.3	− 2 04.4	− 1 47.7
18	− 2 17.1	− 2 00.2	− 1 43.6
24	− 2 12.8	− 1 56.0	− 1 39.4

GCT of Transit Meridian of Greenwich

DAY	Moon (h m)	Venus (h m)	Mars (h m)	Jupiter (h m)	Saturn (h m)
7	12 45	14 12	12 44	10 50	22 54
8	13 30	14 13	12 43	10 47	22 49
9	14 17	14 14	12 42	10 44	22 45
10	15 06	14 15	12 41	10 41	22 41

ADDITIONAL ALTITUDE CORRECTIONS

Alt. (°)	Sun's Low'r Limb (′)	Venus (′)	Mars (′)
0			
	0.3	0.1	0.1
30			
	0.3	0.1	0.0
45			
	0.3	0.1	0.0
60			
	0.3	0.0	0.0
75			
	0.3	0.0	0.0
90			

Moon's Lower Limb

Add

Alt. (°)	7 (′)	8 (′)	9 (′)
0			
	13.6	13.0	12.5
4			
	13.7	13.0	12.5
8			
	13.7	13.0	12.5
12			
	13.7	13.1	12.6
16			
	13.7	13.1	12.6
20			
	13.8	13.2	12.7
24			
	13.8	13.2	12.7
28			
	13.8	13.3	12.8
32			
	13.9	13.3	12.9
36			
	14.0	13.4	13.0
40			
	14.0	13.5	13.1
44			
	14.1	13.6	13.2
48			
	14.2	13.7	13.4
52			
	14.3	13.8	13.5
56			
	14.3	13.9	13.6
60			
	14.4	14.1	13.8
64			
	14.5	14.2	13.9
68			
	14.6	14.3	14.1
72			
	14.7	14.5	14.2
76			
	14.8	14.6	14.4
80			
	14.9	14.7	14.6
84			
	15.0	14.9	14.7
88			
	15.1	15.0	14.9
90			

Add to table, back cover

Moon's Upper Limb

Subtract

Alt. (°)	7 (′)	8 (′)	9 (′)
0			
	16.6	17.0	17.3
4			
	16.6	17.0	17.3
8			
	16.6	17.0	17.3
12			
	16.6	16.9	17.2
16			
	16.6	16.9	17.2
20			
	16.5	16.9	17.1
24			
	16.5	16.8	17.1
28			
	16.4	16.7	17.0
32			
	16.4	16.7	16.9
36			
	16.3	16.6	16.8
40			
	16.3	16.5	16.7
44			
	16.2	16.4	16.6
48			
	16.1	16.3	16.4
52			
	16.0	16.2	16.3
56			
	15.9	16.1	16.2
60			
	15.8	15.9	16.0
64			
	15.8	15.8	15.9
68			
	15.7	15.7	15.7
72			
	15.6	15.6	15.6
76			
	15.5	15.4	15.4
80			
	15.4	15.3	15.2
84			
	15.2	15.1	15.1
88			
	15.2	15.0	14.9
90			

Subtract from table, back cover

GCT	♈ GHA	VENUS −3.4 GHA	VENUS Dec.	MARS 1.5 GHA	MARS Dec.	JUPITER −1.6 GHA	JUPITER Dec.	SATURN 0.9 GHA	SATURN Dec.	MOON GHA	code	MOON Dec.	code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
0	197 25.0	146 25.9	+19 35.4	169 42.5	+11 09.0	199 26.4	− 2 01.7	18 45.7	+ 3 20.6	141 06.6	114	+24 52.9	+ 75
1	212 27.5	161 25.4	36.3	184 43.2	09.7	214 28.3	01.4	33 48.3	20.7	155 37.0	114	25 00.4	+ 73
2	227 29.9	176 24.8	37.1	199 43.9	10.4	229 30.3	01.2	48 51.0	20.7	170 07.4	113	25 07.7	+ 72
3	242 32.4	191 24.2	·· 38.0	214 44.6	·· 11.1	244 32.2	·· 01.0	63 53.6	·· 20.8	184 37.7	112	·25 14.9	+ 71
4	257 34.9	206 23.7	38.9	229 45.3	11.8	259 34.1	00.8	78 56.2	20.9	199 07.9	113	25 22.0	+ 70
5	272 37.3	221 23.1	39.7	244 46.0	12.4	274 36.1	00.5	93 58.9	20.9	213 38.2	111	25 29.0	+ 68
6	287 39.8	236 22.5	+19 40.6	259 46.7	+11 13.1	289 38.0	− 2 00.3	109 01.5	+ 3 21.0	228 08.3	112	+25 35.8	+ 68
7	302 42.2	251 21.9	41.5	274 47.4	13.8	304 39.9	2 00.1	124 04.1	21.1	242 38.5	110	25 42.6	+ 66
8	317 44.7	266 21.4	42.3	289 48.1	14.5	319 41.8	1 59.8	139 06.7	21.1	257 08.5	111	25 49.2	+ 64
9	332 47.2	281 20.8	·· 43.2	304 48.8	·· 15.2	334 43.8	·· 59.6	154 09.4	·· 21.2	271 38.6	110	·25 55.6	+ 64
10	347 49.6	296 20.2	44.1	319 49.5	15.8	349 45.7	59.4	169 12.0	21.3	286 08.6	109	26 02.0	+ 62
11	2 52.1	311 19.6	44.9	334 50.2	16.5	4 47.6	59.2	184 14.6	21.3	300 38.5	109	26 08.2	+ 61
12	17 54.6	326 19.1	+19 45.8	349 50.9	+11 17.2	19 49.6	− 1 58.9	199 17.2	+ 3 21.4	315 08.4	109	+26 14.3	+ 60
13	32 57.0	341 18.5	46.7	4 51.5	17.9	34 51.5	58.7	214 19.9	21.5	329 38.3	108	26 20.3	+ 59
14	47 59.5	356 17.9	47.5	19 52.2	18.6	49 53.4	58.5	229 22.5	21.5	344 08.1	108	26 26.2	+ 57
15	63 02.0	11 17.3	·· 48.4	34 52.9	·· 19.2	64 55.3	·· 58.2	244 25.1	·· 21.6	358 37.9	107	·26 31.9	+ 56
16	78 04.4	26 16.8	49.3	49 53.6	19.9	79 57.3	58.0	259 27.7	21.7	13 07.6	107	26 37.5	+ 55
17	93 06.9	41 16.2	50.1	64 54.3	20.6	94 59.2	57.8	274 30.4	21.7	27 37.3	107	26 43.0	+ 54
18	108 09.4	56 15.6	+19 51.0	79 55.0	+11 21.3	110 01.1	− 1 57.6	289 33.0	+ 3 21.8	42 07.0	106	+26 48.4	+ 52
19	123 11.8	71 15.0	51.8	94 55.7	22.0	125 03.1	57.3	304 35.6	21.9	56 36.6	106	26 53.6	+ 51
20	138 14.3	86 14.4	52.7	109 56.4	22.6	140 05.0	57.1	319 38.2	21.9	71 06.2	105	26 58.7	+ 49
21	153 16.7	101 13.9	·· 53.5	124 57.1	·· 23.3	155 06.9	·· 56.9	334 40.9	·· 22.0	85 35.7	105	·27 03.6	+ 49
22	168 19.2	116 13.3	54.4	139 57.8	24.0	170 08.8	56.6	349 43.5	22.1	100 05.2	105	27 08.5	+ 47
23	183 21.7	131 12.7	55.2	154 58.5	24.7	185 10.8	56.4	4 46.1	22.1	114 34.7	105	27 13.2	+ 46
0	198 24.1	146 12.1	+19 56.1	169 59.2	+11 25.3	200 12.7	− 1 56.2	19 48.7	+ 3 22.2	129 04.2	104	+27 17.8	+ 44
1	213 26.6	161 11.5	57.0	184 59.9	26.0	215 14.6	56.0	34 51.3	22.3	143 33.6	103	27 22.2	+ 43
2	228 29.1	176 11.0	57.8	200 00.6	26.7	230 16.6	55.7	49 54.0	22.3	158 02.9	104	27 26.5	+ 42
3	243 31.5	191 10.4	·· 58.7	215 01.3	·· 27.4	245 18.5	·· 55.5	64 56.6	·· 22.4	172 32.3	103	·27 30.7	+ 40
4	258 34.0	206 09.8	19 59.5	230 02.0	28.0	260 20.4	55.3	79 59.2	22.5	187 01.6	103	27 34.7	+ 40
5	273 36.5	221 09.2	20 00.4	245 02.7	28.7	275 22.3	55.1	95 01.8	22.5	201 30.9	102	27 38.7	+ 37
6	288 38.9	236 08.6	+20 01.2	260 03.4	+11 29.4	290 24.3	− 1 54.8	110 04.5	+ 3 22.6	216 00.1	103	+27 42.4	+ 37
7	303 41.4	251 08.0	02.1	275 04.1	30.1	305 26.2	54.6	125 07.1	22.7	230 29.4	101	27 46.1	+ 35
8	318 43.9	266 07.5	02.9	290 04.8	30.7	320 28.1	54.4	140 09.7	22.7	244 58.5	102	27 49.6	+ 34
9	333 46.3	281 06.9	·· 03.7	305 05.5	·· 31.4	335 30.1	·· 54.1	155 12.3	·· 22.8	259 27.7	102	·27 53.0	+ 32
10	348 48.8	296 06.3	04.6	320 06.2	32.1	350 32.0	53.9	170 15.0	22.9	273 56.9	101	27 56.2	+ 31
11	3 51.2	311 05.7	05.4	335 06.8	32.8	5 33.9	53.7	185 17.6	22.9	288 26.0	101	27 59.3	+ 30
12	18 53.7	326 05.1	+20 06.3	350 07.5	+11 33.4	20 35.8	− 1 53.5	200 20.2	+ 3 23.0	302 55.1	100	+28 02.3	+ 29
13	33 56.2	341 04.5	07.1	5 08.2	34.1	35 37.8	53.2	215 22.8	23.1	317 24.1	101	28 05.2	+ 27
14	48 58.6	356 04.0	08.0	20 08.9	34.8	50 39.7	53.0	230 25.5	23.1	331 53.2	100	28 07.9	+ 25
15	64 01.1	11 03.4	·· 08.8	35 09.6	·· 35.5	65 41.6	·· 52.8	245 28.1	·· 23.2	346 22.2	100	·28 10.4	+ 25
16	79 03.6	26 02.8	09.6	50 10.3	36.1	80 43.6	52.6	260 30.7	23.2	0 51.2	100	28 12.9	+ 23
17	94 06.0	41 02.2	10.5	65 11.0	36.8	95 45.5	52.3	275 33.3	23.3	15 20.2	100	28 15.2	+ 21
18	109 08.5	56 01.6	+20 11.3	80 11.7	+11 37.5	110 47.4	− 1 52.1	290 35.9	+ 3 23.4	29 49.2	99	+28 17.3	+ 21
19	124 11.0	71 01.0	12.1	95 12.4	38.2	125 49.4	51.9	305 38.6	23.4	44 18.1	100	28 19.4	+ 18
20	139 13.4	86 00.4	13.0	110 13.1	38.8	140 51.3	51.6	320 41.2	23.5	58 47.1	99	28 21.2	+ 18
21	154 15.9	100 59.8	·· 13.8	125 13.8	·· 39.5	155 53.2	·· 51.4	335 43.8	·· 23.6	73 16.0	99	·28 23.0	+ 16
22	169 18.3	115 59.2	14.6	140 14.5	40.2	170 55.1	51.2	350 46.4	23.6	87 44.9	99	28 24.6	+ 15
23	184 20.8	130 58.7	15.5	155 15.2	40.9	185 57.1	51.0	5 49.1	23.7	102 13.8	99	28 26.1	+ 13
0	199 23.3	145 58.1	+20 16.3	170 15.9	+11 41.5	200 59.0	− 1 50.7	20 51.7	+ 3 23.8	116 42.7	99	+28 27.4	+ 12
1	214 25.7	160 57.5	17.1	185 16.6	42.2	216 00.9	50.5	35 54.3	23.8	131 11.6	98	28 28.6	+ 11
2	229 28.2	175 56.9	18.0	200 17.3	42.9	231 02.9	50.3	50 56.9	23.9	145 40.4	99	28 29.7	+ 9
3	244 30.7	190 56.3	·· 18.8	215 18.0	·· 43.5	246 04.8	·· 50.1	65 59.5	·· 24.0	160 09.3	98	·28 30.6	+ 8
4	259 33.1	205 55.7	19.6	230 18.7	44.2	261 06.7	49.8	81 02.2	24.0	174 38.1	99	28 31.4	+ 6
5	274 35.6	220 55.1	20.5	245 19.3	44.9	276 08.7	49.6	96 04.8	24.1	189 07.0	98	28 32.0	+ 6
6	289 38.1	235 54.5	+20 21.3	260 20.0	+11 45.6	291 10.6	− 1 49.4	111 07.4	+ 3 24.2	203 35.8	98	+28 32.6	+ 3
7	304 40.5	250 53.9	22.1	275 20.7	46.2	306 12.5	49.1	126 10.0	24.2	218 04.6	99	28 32.9	+ 3
8	319 43.0	265 53.3	22.9	290 21.4	46.9	321 14.5	48.9	141 12.7	24.3	232 33.5	98	28 33.2	+ 1
9	334 45.5	280 52.7	·· 23.8	305 22.1	·· 47.6	336 16.4	·· 48.7	156 15.3	·· 24.4	247 02.3	98	·28 33.3	− 1
10	349 47.9	295 52.1	24.6	320 22.8	48.2	351 18.3	48.5	171 17.9	24.4	261 31.1	99	28 33.2	− 2
11	4 50.4	310 51.5	25.4	335 23.5	48.9	6 20.2	48.2	186 20.5	24.5	276 00.0	98	28 33.0	− 3
12	19 52.8	325 51.0	+20 26.2	350 24.2	+11 49.6	21 22.2	− 1 48.0	201 23.1	+ 3 24.5	290 28.8	98	+28 32.7	− 4
13	34 55.3	340 50.4	27.0	5 24.9	50.2	36 24.1	47.8	216 25.8	24.6	304 57.6	99	28 32.3	− 6
14	49 57.8	355 49.8	27.9	20 25.6	50.9	51 26.0	47.6	231 28.4	24.7	319 26.5	98	28 31.7	− 8
15	65 00.2	10 49.2	·· 28.7	35 26.3	·· 51.6	66 28.0	·· 47.3	246 31.0	·· 24.7	333 55.3	99	·28 30.9	− 8
16	80 02.7	25 48.6	29.5	50 27.0	52.2	81 29.9	47.1	261 33.6	24.8	348 24.2	98	28 30.1	− 10
17	95 05.2	40 48.0	30.3	65 27.7	52.9	96 31.8	46.9	276 36.2	24.9	2 53.0	99	28 29.1	− 12
18	110 07.6	55 47.4	+20 31.1	80 28.4	+11 53.6	111 33.8	− 1 46.7	291 38.9	+ 3 24.9	17 21.9	98	+28 27.9	− 13
19	125 10.1	70 46.8	31.9	95 29.0	54.3	126 35.7	46.4	306 41.5	25.0	31 50.7	99	28 26.6	− 14
20	140 12.6	85 46.2	32.8	110 29.7	54.9	141 37.6	46.2	321 44.1	25.1	46 19.6	99	28 25.2	− 16
21	155 15.0	100 45.6	·· 33.6	125 30.4	·· 55.6	156 39.6	·· 46.0	336 46.7	·· 25.1	60 48.5	99	·28 23.6	− 17
22	170 17.5	115 45.0	34.4	140 31.1	56.3	171 41.5	45.7	351 49.3	25.2	75 17.4	99	28 21.9	− 18
23	185 20.0	130 44.4	35.2	155 31.8	56.9	186 43.4	45.5	6 52.0	25.3	89 46.3	100	28 20.1	− 20
24	200 22.4	145 43.8	+20 36.0	170 32.5	+11 57.6	201 45.4	− 1 45.3	21 54.6	+ 3 25.3	104 15.3	99	+28 18.1	− 21
code	—	− 6	+ 8	+ 7	+ 7	+ 20	+ 3	+ 26	+ 1				

GCT	SUN GHA	SUN Dec.
h	° ′	° ′
0	179 35.2	+ 7 33.9
1	194 35.4	34.9
2	209 35.6	35.8
3	224 35.7 ··	36.7
4	239 35.9	37.7
5	254 36.1	38.6
6	269 36.3	+ 7 39.5
7	284 36.4	40.4
8	299 36.6	41.4
9	314 36.8 ··	42.3
10	329 36.9	43.2
11	344 37.1	44.2
12	359 37.3	+ 7 45.1
13	14 37.4	46.0
14	29 37.6	46.9
15	44 37.8 ··	47.9
16	59 38.0	48.8
17	74 38.1	49.7
18	89 38.3	+ 7 50.6
19	104 38.5	51.6
20	119 38.6	52.5
21	134 38.8 ··	53.4
22	149 39.0	54.3
23	164 39.1	55.3
0	179 39.3	+ 7 56.2
1	194 39.5	57.1
2	209 39.6	58.0
3	224 39.8 ··	59.0
4	239 40.0	7 59.9
5	254 40.2	8 00.8
6	269 40.3	+ 8 01.7
7	284 40.5	02.7
8	299 40.7	03.6
9	314 40.8 ··	04.5
10	329 41.0	05.4
11	344 41.2	06.4
12	359 41.3	+ 8 07.3
13	14 41.5	08.2
14	29 41.7	09.1
15	44 41.8 ··	10.0
16	59 42.0	11.0
17	74 42.2	11.9
18	89 42.3	+ 8 12.8
19	104 42.5	13.7
20	119 42.7	14.6
21	134 42.8 ··	15.6
22	149 43.0	16.5
23	164 43.2	17.4
0	179 43.3	+ 8 18.3
1	194 43.5	19.2
2	209 43.7	20.2
3	224 43.8 ··	21.1
4	239 44.0	22.0
5	254 44.2	22.9
6	269 44.3	+ 8 23.8
7	284 44.5	24.7
8	299 44.7	25.7
9	314 44.8 ··	26.6
10	329 45.0	27.5
11	344 45.2	28.4
12	359 45.3	+ 8 29.3
13	14 45.5	30.2
14	29 45.6	31.2
15	44 45.8 ··	32.1
16	59 46.0	33.0
17	74 46.1	33.9
18	89 46.3	+ 8 34.8
19	104 46.5	35.7
20	119 46.6	36.7
21	134 46.8 ··	37.6
22	149 47.0	38.5
23	164 47.1	39.4
24	179 47.3	+ 8 40.3
code	—	+ 9

No.	STARS SHA	Dec.	Transit Mer. Gr.
	° ′	° ′	h m
1	358 32.4	+28 49.1	10 50
2	358 22.3	+58 52.7	10 51
3	349 43.1	−18 15.3	11 26
4	339 21.7	+59 59.0	12 07
5	336 01.8	−57 29.0	12 20
6	333 01.7	+89 02.2	12 32
7	328 54.0	+23 14.0	12 49
8	315 54.1	−40 30.0	13 41
9	309 48.0	+49 41.5	14 05
10	291 43.4	+16 24.9	15 17
11	281 57.2	− 8 15.4	15 56
12	281 43.9	+45 57.3	15 57
13	279 22.4	+ 6 18.5	16 06
14	279 12.0	+28 34.3	16 07
15	276 34.0	− 1 13.9	16 17
16	271 52.1	+ 7 24.0	16 36
17	264 17.1	−52 40.3	17 06
18	259 15.0	−16 38.9	17 27
19	255 49.4	−28 54.4	17 40
20	245 48.7	+ 5 21.1	18 20
21	244 24.8	+28 08.9	18 26
22	234 37.3	−59 21.3	19 05
23	223 26.9	−43 14.3	19 49
24	221 49.8	−69 31.2	19 56
25	218 41.9	− 8 26.9	20 08
26	208 33.0	+12 12.4	20 49
27	194 48.1	+62 01.0	21 44
28	183 21.0	+14 50.6	22 29
29	174 01.4	−62 49.9	23 06
30	172 52.9	−56 50.6	23 11
31	168 46.7	−59 25.5	23 27
32	167 00.8	+56 13.4	23 34
33	159 29.7	+55 10.6	0 08
34	159 20.3	−10 54.7	0 09
35	153 35.0	+49 33.2	0 32
36	149 02.6	−36 08.0	0 50
37	146 38.0	+19 25.9	1 00
38	140 55.5	−60 38.3	1 22
39	137 16.1	+74 21.0	1 37
40	126 50.3	+26 52.3	2 19
41	120 38.0	−22 29.3	2 43
42	113 23.5	−26 19.7	3 12
43	109 07.2	−68 56.5	3 29
44	103 06.1	−15 40.2	3 53
45	97 25.3	−37 04.3	4 16
46	96 49.7	+12 35.3	4 18
47	91 07.7	+51 29.2	4 41
48	84 45.7	−34 24.7	5 07
49	81 10.6	+38 43.8	5 21
50	76 56.2	−26 21.7	5 38
51	62 53.9	+ 8 44.0	6 34
52	54 32.8	−56 53.5	7 07
53	50 03.7	+45 05.9	7 25
54	34 33.3	+ 9 38.8	8 27
55	28 42.5	−47 11.8	8 50
56	16 15.7	−29 52.9	9 40
57	14 25.3	+14 56.4	9 47

Lat.	Sunrise	Twlt. begins	Moonrise 10	11	12	13
N °	h m	h m	h m	h m	h m	h m
70	4 19	////	□	□	□	□
68	4 30	////	□	□	□	□
66	4 38	////	□	□	□	□
64	4 46	////	3 42	□	□	□
62	4 52	1 31	4 33	4 19	□	□
60	4 58	2 04	5 04	5 16	5 46	6 51
58	5 02	2 26	5 28	5 48	6 26	7 27
56	5 07	2 43	5 47	6 13	6 54	7 53
54	5 11	2 58	6 04	6 33	7 15	8 13
52	5 14	3 09	6 17	6 49	7 33	8 31
50	5 17	3 20	6 30	7 03	7 49	8 45
45	5 24	3 41	6 55	7 33	8 19	9 15
40	5 30	3 56	7 15	7 55	8 43	9 38
35	5 34	4 08	7 32	8 14	9 03	9 57
30	5 39	4 18	7 47	8 31	9 20	10 14
20	5 46	4 32	8 12	8 58	9 48	10 41
10	5 52	4 42	8 33	9 22	10 13	11 05
0	5 58	4 49	8 54	9 44	10 36	11 27
10	6 04	4 54	9 14	10 06	10 58	11 49
20	6 10	4 56	9 36	10 30	11 23	12 13
30	6 16	4 56	10 02	10 58	11 52	12 40
35	6 20	4 55	10 17	11 15	12 09	12 56
40	6 24	4 53	10 34	11 34	12 28	13 15
45	6 29	4 51	10 56	11 58	12 52	13 38
50	6 35	4 46	11 22	12 28	13 23	14 07
52	6 38	4 44	11 36	12 43	13 39	14 21
54	6 41	4 41	11 51	13 01	13 57	14 38
56	6 44	4 38	12 09	13 22	14 19	14 58
58	6 47	4 34	12 31	13 49	14 47	15 22
60	6 51	4 30	12 59	14 28	15 28	15 55
S						

Lat.	Sunset	Twlt. ends	Moonset 10	11	12	13
N °	h m	h m	h m	h m	h m	h m
70	19 46	////	□	□	□	□
68	19 35	////	□	□	□	□
66	19 26	////	□	□	□	□
64	19 19	////	1 29	□	□	□
62	19 12	22 42	0 39	2 37	□	□
60	19 07	22 07	0 08	1 41	2 57	3 40
58	19 02	21 43	25 09	1 09	2 18	3 04
56	18 57	21 24	24 44	0 44	1 50	2 38
54	18 53	21 09	24 25	0 25	1 28	2 17
52	18 50	20 57	24 09	0 09	1 11	2 00
50	18 46	20 46	23 54	24 55	0 55	1 45
45	18 39	20 25	23 26	24 25	0 25	1 15
40	18 34	20 10	23 04	24 01	0 01	0 52
35	18 29	19 57	22 45	23 41	24 32	0 32
30	18 24	19 46	22 29	23 24	24 15	0 15
20	18 17	19 32	22 02	22 56	23 47	24 35
10	18 10	19 21	21 39	22 32	23 23	24 13
0	18 05	19 14	21 18	22 09	23 00	23 52
10	17 59	19 09	20 56	21 46	22 38	23 30
20	17 53	19 06	20 33	21 22	22 14	23 07
30	17 46	19 06	20 07	20 54	21 45	22 41
35	17 42	19 06	19 51	20 37	21 28	22 25
40	17 38	19 08	19 33	20 17	21 09	22 07
45	17 33	19 10	19 11	19 53	20 45	21 44
50	17 27	19 14	18 44	19 23	20 14	21 16
52	17 24	19 16	18 30	19 08	19 58	21 02
54	17 21	19 19	18 15	18 50	19 40	20 45
56	17 18	19 22	17 56	18 28	19 18	20 26
58	17 14	19 25	17 34	18 01	18 50	20 02
60	17 10	19 29	17 05	17 22	18 09	19 29
S						

GCT	Equation of Time (App.—Mean) 10	11	12
h	m s	m s	m s
0	− 1 39.4	− 1 23.1	− 1 07.0
6	− 1 35.3	− 1 19.0	− 1 03.0
12	− 1 31.2	− 1 15.0	− 0 59.1
18	− 1 27.2	− 1 11.0	− 0 55.1
24	− 1 23.1	− 1 07.0	− 0 51.2

GCT of Transit Meridian of Greenwich

DAY	Moon	Venus	Mars	Jupiter	Saturn
	h m	h m	h m	h m	h m
10	15 06	14 15	12 41	10 41	22 41
11	15 57	14 16	12 40	10 38	22 37
12	16 48	14 17	12 38	10 35	22 33
13	17 39	14 18	12 37	10 32	22 28

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb	Venus	Mars
°	′	′	′
0	0.3	0.1	0.1
30	0.3	0.1	0.0
45	0.3	0.1	0.0
60	0.3	0.0	0.0
75	0.3	0.0	0.0
90			

Moon's Lower Limb
Add

Alt.	10	11	12
°	′	′	′
0	12.1	12.0	12.0
4	12.1	12.0	12.0
8	12.2	12.0	12.0
12	12.2	12.1	12.1
16	12.2	12.1	12.1
20	12.3	12.2	12.2
24	12.4	12.3	12.3
28	12.5	12.4	12.4
32	12.6	12.5	12.5
36	12.7	12.6	12.6
40	12.8	12.7	12.7
44	12.9	12.8	12.8
48	13.1	13.0	13.0
52	13.2	13.1	13.1
56	13.4	13.3	13.3
60	13.5	13.5	13.5
64	13.7	13.6	13.6
68	13.9	13.8	13.8
72	14.1	14.0	14.0
76	14.3	14.2	14.2
80	14.4	14.4	14.4
84	14.6	14.6	14.6
88	14.8	14.7	14.7
90			

Add to table, back cover

Moon's Upper Limb
Subtract

Alt.	10	11	12
°	′	′	′
0	17.5	17.6	17.6
4	17.5	17.6	17.6
8	17.5	17.5	17.5
12	17.4	17.5	17.5
16	17.4	17.5	17.5
20	17.3	17.4	17.4
24	17.2	17.3	17.3
28	17.2	17.2	17.2
32	17.1	17.1	17.1
36	16.9	17.0	17.0
40	16.8	16.9	16.9
44	16.7	16.7	16.7
48	16.6	16.6	16.6
52	16.4	16.4	16.4
56	16.2	16.3	16.3
60	16.1	16.1	16.1
64	15.9	15.9	15.9
68	15.7	15.7	15.7
72	15.6	15.6	15.6
76	15.4	15.4	15.4
80	15.2	15.2	15.2
84	15.0	15.0	15.0
88	14.9	14.8	14.8
90			

Subtract from table, back cover

GCT	♈ GHA	VENUS −3.4 GHA	Dec.	MARS 1.5 GHA	Dec.	JUPITER −1.6 GHA	Dec.	SATURN 0.9 GHA	Dec.	MOON GHA	code	Dec.	code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
0	200 22.4	145 43.8	+20 36.0	170 32.5	+11 57.6	201 45.4	− 1 45.3	21 54.6	+ 3 25.3	104 15.3	99	+28 18.1	− 21
1	215 24.9	160 43.2	36.8	185 33.2	58.3	216 47.3	45.1	36 57.2	25.4	118 44.2	100	28 16.0	− 22
2	230 27.3	175 42.6	37.6	200 33.9	58.9	231 49.2	44.8	51 59.8	25.4	133 13.2	100	28 13.8	− 24
3	245 29.8	190 42.0	·· 38.4	215 34.6	·11 59.6	246 51.1	·· 44.6	67 02.4	·· 25.5	147 42.2	100	·28 11.4	− 25
4	260 32.3	205 41.4	39.2	230 35.3	12 00.3	261 53.1	44.4	82 05.1	25.6	162 11.2	100	28 08.9	− 27
5	275 34.7	220 40.8	40.0	245 36.0	00.9	276 55.0	44.2	97 07.7	25.6	176 40.2	100	28 06.2	− 28
6	290 37.2	235 40.2	+20 40.8	260 36.7	+12 01.6	291 56.9	− 1 43.9	112 10.3	+ 3 25.7	191 09.2	101	+28 03.4	− 29
7	305 39.7	250 39.6	41.7	275 37.4	02.2	306 58.9	43.7	127 12.9	25.8	205 38.3	100	28 00.5	− 30
8	320 42.1	265 39.0	42.5	290 38.1	02.9	322 00.8	43.5	142 15.5	25.8	220 07.3	101	27 57.5	− 32
9	335 44.6	280 38.4	·· 43.3	305 38.7	·· 03.6	337 02.7	·· 43.3	157 18.2	·· 25.9	234 36.4	102	·27 54.3	− 34
10	350 47.1	295 37.8	44.1	320 39.4	04.2	352 04.7	43.0	172 20.8	26.0	249 05.6	101	27 50.9	− 34
11	5 49.5	310 37.2	44.9	335 40.1	04.9	7 06.6	42.8	187 23.4	26.0	263 34.7	102	27 47.5	− 36
12	20 52.0	325 36.6	+20 45.7	350 40.8	+12 05.6	22 08.5	− 1 42.6	202 26.0	+ 3 26.1	278 03.9	102	+27 43.9	− 38
13	35 54.4	340 36.0	46.5	5 41.5	06.2	37 10.5	42.4	217 28.6	26.1	292 33.1	102	27 40.1	− 38
14	50 56.9	355 35.4	47.3	20 42.2	06.9	52 12.4	42.1	232 31.3	26.2	307 02.3	103	27 36.3	− 40
15	65 59.4	10 34.8	·· 48.0	35 42.9	·· 07.6	67 14.3	·· 41.9	247 33.9	·· 26.3	321 31.6	103	·27 32.3	− 42
16	81 01.8	25 34.1	48.8	50 43.6	08.2	82 16.3	41.7	262 36.5	26.3	336 00.9	103	27 28.1	− 42
17	96 04.3	40 33.5	49.6	65 44.3	08.9	97 18.2	41.5	277 39.1	26.4	350 30.2	103	27 23.9	− 44
18	111 06.8	55 32.9	+20 50.4	80 45.0	+12 09.6	112 20.1	− 1 41.2	292 41.7	+ 3 26.5	4 59.5	104	+27 19.5	− 46
19	126 09.2	70 32.3	51.2	95 45.7	10.2	127 22.1	41.0	307 44.4	26.5	19 28.9	104	27 14.9	− 46
20	141 11.7	85 31.7	52.0	110 46.4	10.9	142 24.0	40.8	322 47.0	26.6	33 58.3	105	27 10.3	− 48
21	156 14.2	100 31.1	·· 52.8	125 47.0	·· 11.5	157 25.9	·· 40.5	337 49.6	·· 26.6	48 27.8	104	·27 05.5	− 50
22	171 16.6	115 30.5	53.6	140 47.7	12.2	172 27.9	40.3	352 52.2	26.7	62 57.2	106	27 00.5	− 50
23	186 19.1	130 29.9	54.4	155 48.4	12.9	187 29.8	40.1	7 54.8	26.8	77 26.8	105	26 55.5	− 52
0	201 21.6	145 29.3	+20 55.2	170 49.1	+12 13.5	202 31.7	− 1 39.9	22 57.4	+ 3 26.8	91 56.3	106	+26 50.3	− 53
1	216 24.0	160 28.7	56.0	185 49.8	14.2	217 33.7	39.6	38 00.1	26.9	106 25.9	106	26 45.0	− 54
2	231 26.5	175 28.1	56.7	200 50.5	14.8	232 35.6	39.4	53 02.7	27.0	120 55.5	106	26 39.6	− 56
3	246 28.9	190 27.5	·· 57.5	215 51.2	·· 15.5	247 37.5	·· 39.2	68 05.3	·· 27.0	135 25.1	107	·26 34.0	− 57
4	261 31.4	205 26.9	58.3	230 51.9	16.2	262 39.5	39.0	83 07.9	27.1	149 54.8	107	26 28.3	− 58
5	276 33.9	220 26.2	59.1	245 52.6	16.8	277 41.4	38.7	98 10.5	27.2	164 24.5	108	26 22.5	− 60
6	291 36.3	235 25.6	+20 59.9	260 53.3	+12 17.5	292 43.3	− 1 38.5	113 13.2	+ 3 27.2	178 54.3	108	+26 16.5	− 61
7	306 38.8	250 25.0	21 00.7	275 54.0	18.1	307 45.3	38.3	128 15.8	27.3	193 24.1	108	26 10.4	− 62
8	321 41.3	265 24.4	01.4	290 54.6	18.8	322 47.2	38.1	143 18.4	27.3	207 53.9	109	26 04.2	− 63
9	336 43.7	280 23.8	·· 02.2	305 55.3	·· 19.5	337 49.1	·· 37.8	158 21.0	·· 27.4	222 23.8	109	·25 57.9	− 65
10	351 46.2	295 23.2	03.0	320 56.0	20.1	352 51.1	37.6	173 23.6	27.5	236 53.7	110	25 51.4	− 66
11	6 48.7	310 22.6	03.8	335 56.7	20.8	7 53.0	37.4	188 26.2	27.5	251 23.7	110	25 44.8	− 67
12	21 51.1	325 22.0	+21 04.6	350 57.4	+12 21.4	22 54.9	− 1 37.2	203 28.9	+ 3 27.6	265 53.7	110	+25 38.1	− 68
13	36 53.6	340 21.3	05.3	5 58.1	22.1	37 56.9	36.9	218 31.5	27.6	280 23.7	111	25 31.3	− 69
14	51 56.1	355 20.7	06.1	20 58.8	22.8	52 58.8	36.7	233 34.1	27.7	294 53.8	111	25 24.4	− 71
15	66 58.5	10 20.1	·· 06.9	35 59.5	·· 23.4	68 00.7	·· 36.5	248 36.7	·· 27.8	309 23.9	112	·25 17.3	− 72
16	82 01.0	25 19.5	07.6	51 00.2	24.1	83 02.7	36.3	263 39.3	27.8	323 54.1	112	25 10.1	− 73
17	97 03.4	40 18.9	08.4	66 00.9	24.7	98 04.6	36.0	278 41.9	27.9	338 24.3	113	25 02.8	− 75
18	112 05.9	55 18.3	+21 09.2	81 01.5	+12 25.4	113 06.6	− 1 35.8	293 44.6	+ 3 28.0	352 54.6	113	+24 55.3	− 75
19	127 08.4	70 17.7	10.0	96 02.2	26.0	128 08.5	35.6	308 47.2	28.0	7 24.9	113	24 47.8	− 77
20	142 10.8	85 17.0	10.7	111 02.9	26.7	143 10.4	35.4	323 49.8	28.1	21 55.2	114	24 40.1	− 78
21	157 13.3	100 16.4	·· 11.5	126 03.6	·· 27.4	158 12.4	·· 35.1	338 52.4	·· 28.1	36 25.6	114	·24 32.3	− 79
22	172 15.8	115 15.8	12.3	141 04.3	28.0	173 14.3	34.9	353 55.0	28.2	50 56.0	115	24 24.4	− 81
23	187 18.2	130 15.2	13.0	156 05.0	28.7	188 16.2	34.7	8 57.6	28.3	65 26.5	115	24 16.3	− 81
0	202 20.7	145 14.6	+21 13.8	171 05.7	+12 29.3	203 18.2	− 1 34.5	24 00.3	+ 3 28.3	79 57.0	115	+24 08.2	− 83
1	217 23.2	160 14.0	14.6	186 06.4	30.0	218 20.1	34.2	39 02.9	28.4	94 27.5	116	23 59.9	− 84
2	232 25.6	175 13.3	15.3	201 07.1	30.6	233 22.0	34.0	54 05.5	28.5	108 58.1	117	23 51.5	− 85
3	247 28.1	190 12.7	·· 16.1	216 07.8	·· 31.3	248 24.0	·· 33.8	69 08.1	·· 28.5	123 28.8	117	·23 43.0	− 86
4	262 30.6	205 12.1	16.8	231 08.4	32.0	263 25.9	33.6	84 10.7	28.6	137 59.5	117	23 34.4	− 87
5	277 33.0	220 11.5	17.6	246 09.1	32.6	278 27.8	33.3	99 13.3	28.6	152 30.2	118	23 25.7	− 89
6	292 35.5	235 10.9	+21 18.4	261 09.8	+12 33.3	293 29.8	− 1 33.1	114 15.9	+ 3 28.7	167 01.0	118	+23 16.8	− 89
7	307 37.9	250 10.2	19.1	276 10.5	33.9	308 31.7	32.9	129 18.6	28.8	181 31.8	118	23 07.9	− 91
8	322 40.4	265 09.6	19.9	291 11.2	34.6	323 33.6	32.7	144 21.2	28.8	196 02.6	120	22 58.8	− 92
9	337 42.9	280 09.0	·· 20.6	306 11.9	·· 35.2	338 35.6	·· 32.4	159 23.8	·· 28.9	210 33.6	119	·22 49.6	− 93
10	352 45.3	295 08.4	21.4	321 12.6	35.9	353 37.5	32.2	174 26.4	28.9	225 04.5	120	22 40.3	− 94
11	7 47.8	310 07.8	22.1	336 13.3	36.5	8 39.5	32.0	189 29.0	29.0	239 35.5	120	22 30.9	− 95
12	22 50.3	325 07.1	+21 22.9	351 14.0	+12 37.2	23 41.4	− 1 31.8	204 31.6	+ 3 29.1	254 06.5	121	+22 21.4	− 97
13	37 52.7	340 06.5	23.7	6 14.6	37.8	38 43.3	31.5	219 34.2	29.1	268 37.6	122	22 11.7	− 97
14	52 55.2	355 05.9	24.4	21 15.3	38.5	53 45.3	31.3	234 36.9	29.2	283 08.8	121	22 02.0	− 98
15	67 57.7	10 05.3	·· 25.2	36 16.0	·· 39.1	68 47.2	·· 31.1	249 39.5	·· 29.2	297 39.9	122	·21 52.2	−100
16	83 00.1	25 04.6	25.9	51 16.7	39.8	83 49.1	30.9	264 42.1	29.3	312 11.1	123	21 42.2	−100
17	98 02.6	40 04.0	26.7	66 17.4	40.4	98 51.1	30.7	279 44.7	29.4	326 42.4	123	21 32.2	−102
18	113 05.1	55 03.4	+21 27.4	81 18.1	+12 41.1	113 53.0	− 1 30.4	294 47.3	+ 3 29.4	341 13.7	123	+21 22.0	−103
19	128 07.5	70 02.8	28.1	96 18.8	41.8	128 54.9	30.2	309 49.9	29.5	355 45.0	124	21 11.7	−103
20	143 10.0	85 02.2	28.9	111 19.5	42.4	143 56.9	30.0	324 52.5	29.6	10 16.4	124	21 01.4	−105
21	158 12.4	100 01.5	·· 29.6	126 20.2	·· 43.1	158 58.8	·· 29.8	339 55.2	·· 29.6	24 47.8	125	·20 50.9	−106
22	173 14.9	115 00.9	30.4	141 20.8	43.7	174 00.8	29.5	354 57.8	29.7	39 19.3	125	20 40.3	−107
23	188 17.4	130 00.3	31.1	156 21.5	44.4	189 02.7	29.3	10 00.4	29.7	53 50.8	126	20 29.6	−108
24	203 19.8	144 59.7	+21 31.9	171 22.2	+12 45.0	204 04.6	− 1 29.1	25 03.0	+ 3 29.8	68 22.4	125	+20 18.8	−109
code	—	− 7	+ 7	+ 7	+ 7	+ 20	+ 3	+ 26	0				

GCT	SUN GHA	SUN Dec.
h	° ′	° ′
0	179 47.3	+ 8 40.3
1	194 47.4	41.2
2	209 47.6	42.1
3	224 47.8	•• 43.0
4	239 47.9	44.0
5	254 48.1	44.9
6	269 48.3	+ 8 45.8
7	284 48.4	46.7
8	299 48.6	47.6
9	314 48.7	•• 48.5
10	329 48.9	49.4
11	344 49.1	50.3
12	359 49.2	+ 8 51.2
13	14 49.4	52.2
14	29 49.6	53.1
15	44 49.7	•• 54.0
16	59 49.9	54.9
17	74 50.0	55.8
18	89 50.2	+ 8 56.7
19	104 50.4	57.6
20	119 50.5	58.5
21	134 50.7	• 8 59.4
22	149 50.8	9 00.3
23	164 51.0	01.2
0	179 51.2	+ 9 02.1
1	194 51.3	03.1
2	209 51.5	04.0
3	224 51.6	•• 04.9
4	239 51.8	05.8
5	254 52.0	06.7
6	269 52.1	+ 9 07.6
7	284 52.3	08.5
8	299 52.4	09.4
9	314 52.6	•• 10.3
10	329 52.8	11.2
11	344 52.9	12.1
12	359 53.1	+ 9 13.0
13	14 53.2	13.9
14	29 53.4	14.8
15	44 53.5	•• 15.7
16	59 53.7	16.6
17	74 53.9	17.5
18	89 54.0	+ 9 18.4
19	104 54.2	19.3
20	119 54.3	20.2
21	134 54.5	•• 21.1
22	149 54.6	22.0
23	164 54.8	22.9
0	179 55.0	+ 9 23.8
1	194 55.1	24.7
2	209 55.3	25.6
3	224 55.4	•• 26.5
4	239 55.6	27.4
5	254 55.7	28.3
6	269 55.9	+ 9 29.2
7	284 56.1	30.1
8	299 56.2	31.0
9	314 56.4	•• 31.9
10	329 56.5	32.8
11	344 56.7	33.7
12	359 56.8	+ 9 34.6
13	14 57.0	35.5
14	29 57.1	36.4
15	44 57.3	•• 37.3
16	59 57.4	38.2
17	74 57.6	39.1
18	89 57.8	+ 9 40.0
19	104 57.9	40.9
20	119 58.1	41.8
21	134 58.2	•• 42.7
22	149 58.4	43.6
23	164 58.5	44.5
24	179 58.7	+ 9 45.4
code	–	+ 9

STARS No.	SHA	Dec.	Transit Mer. Gr.
	° ′	° ′	h m
1	358 32.4	+28 49.1	10 39
2	358 22.3	+58 52.7	10 39
3	349 43.1	−18 15.3	11 14
4	339 21.7	+59 59.0	11 55
5	336 01.8	−57 29.0	12 08
6	333 01.7	+89 02.2	12 20
7	328 54.0	+23 14.0	12 37
8	315 54.1	−40 30.0	13 29
9	309 48.0	+49 41.5	13 53
10	291 43.4	+16 24.9	15 05
11	281 57.2	− 8 15.4	15 44
12	281 44.0	+45 57.3	15 45
13	279 22.4	+ 6 18.5	15 54
14	279 12.0	+28 34.3	15 55
15	276 34.0	− 1 13.9	16 06
16	271 52.1	+ 7 24.0	16 24
17	264 17.1	−52 40.3	16 55
18	259 15.1	−16 38.9	17 15
19	255 49.4	−28 54.4	17 28
20	245 48.7	+ 5 21.1	18 08
21	244 24.9	+28 08.9	18 14
22	234 37.3	−59 21.3	18 53
23	223 26.9	−43 14.3	19 38
24	221 49.8	−69 31.2	19 44
25	218 41.9	− 8 26.9	19 56
26	208 33.1	+12 12.4	20 37
27	194 48.1	+62 01.0	21 32
28	183 21.0	+14 50.6	22 18
29	174 01.4	−62 50.0	22 55
30	172 52.9	−56 50.6	22 59
31	168 46.7	−59 25.5	23 16
32	167 00.8	+56 13.4	23 23
33	159 29.7	+55 10.6	23 53
34	159 20.3	−10 54.7	23 53
35	153 35.0	+49 33.2	0 20
36	149 02.6	−36 08.1	0 38
37	146 38.0	+19 25.9	0 48
38	140 55.4	−60 38.3	1 11
39	137 16.1	+74 21.0	1 25
40	126 50.3	+26 52.3	2 07
41	120 38.0	−22 29.3	2 32
42	113 23.5	−26 19.7	3 01
43	109 07.1	−68 56.5	3 18
44	103 06.0	−15 40.2	3 42
45	97 25.3	−37 04.3	4 04
46	96 49.7	+12 35.3	4 07
47	91 07.6	+51 29.2	4 29
48	84 45.7	−34 24.7	4 55
49	81 10.5	+38 43.8	5 09
50	76 56.2	−26 21.7	5 26
51	62 53.9	+ 8 44.0	6 22
52	54 32.8	−56 53.5	6 55
53	50 03.6	+45 05.9	7 13
54	34 33.2	+ 9 38.8	8 15
55	28 42.5	−47 11.8	8 38
56	16 15.7	−29 52.9	9 28
57	14 25.3	+14 56.4	9 35

Lat.	Sunrise	Twlt. begins	Moonrise 13	Moonrise 14	Moonrise 15	Moonrise 16
N °	h m	h m	h m	h m	h m	h m
70	4 04	////	▭	▭	▭	9 18
68	4 17	////	▭	▭	▭	10 06
66	4 27	////	▭	▭	8 12	10 36
64	4 35	////	▭	▭	9 01	10 59
62	4 42	1 02	▭	7 41	9 32	11 16
60	4 49	1 45	6 51	8 19	9 55	11 31
58	4 54	2 12	7 27	8 46	10 14	11 44
56	4 59	2 32	7 53	9 07	10 29	11 54
54	5 03	2 47	8 13	9 24	10 43	12 04
52	5 07	3 00	8 31	9 39	10 54	12 12
50	5 11	3 12	8 45	9 52	11 04	12 20
45	5 19	3 33	9 15	10 18	11 26	12 35
40	5 25	3 50	9 38	10 39	11 43	12 48
35	5 30	4 03	9 57	10 56	11 57	12 59
30	5 35	4 13	10 14	11 11	12 10	13 09
20	5 43	4 29	10 41	11 36	12 31	13 26
10	5 51	4 40	11 05	11 57	12 49	13 40
0	5 57	4 47	11 27	12 18	13 06	13 53
10	6 04	4 54	11 49	12 38	13 23	14 06
20	6 11	4 56	12 13	12 59	13 41	14 20
30	6 18	4 57	12 40	13 24	14 02	14 36
35	6 23	4 58	12 56	13 38	14 14	14 46
40	6 27	4 56	13 15	13 55	14 28	14 56
45	6 33	4 54	13 38	14 15	14 45	15 09
50	6 40	4 51	14 07	14 40	15 05	15 24
52	6 43	4 49	14 21	14 52	15 14	15 31
54	6 46	4 46	14 38	15 06	15 25	15 38
56	6 50	4 44	14 58	15 22	15 37	15 47
58	6 54	4 41	15 22	15 41	15 51	15 56
60	6 59	4 37	15 55	16 04	16 07	16 07
S						

Lat.	Sunset	Twlt. ends	Moonset 13	Moonset 14	Moonset 15	Moonset 16
N °	h m	h m	h m	h m	h m	h m
70	20 00	////	▭	▭	▭	6 24
68	19 47	////	▭	▭	▭	5 35
66	19 36	////	▭	▭	5 49	5 03
64	19 28	////	▭	▭	4 59	4 40
62	19 20	23 13	▭	4 36	4 27	4 21
60	19 14	22 25	3 40	3 57	4 03	4 05
58	19 08	21 56	3 04	3 30	3 44	3 52
56	19 03	21 35	2 38	3 09	3 28	3 40
54	18 59	21 19	2 17	2 51	3 14	3 30
52	18 55	21 05	2 00	2 36	3 02	3 21
50	18 51	20 53	1 45	2 23	2 52	3 13
45	18 43	20 30	1 15	1 56	2 29	2 56
40	18 37	20 14	0 52	1 35	2 11	2 41
35	18 31	20 00	0 32	1 17	1 56	2 29
30	18 26	19 49	0 15	1 02	1 42	2 19
20	18 18	19 33	24 35	0 35	1 20	2 00
10	18 10	19 21	24 13	0 13	1 00	1 44
0	18 04	19 14	23 52	24 41	0 41	1 29
10	17 57	19 07	23 30	24 22	0 22	1 14
20	17 50	19 04	23 07	24 02	0 02	0 57
30	17 43	19 03	22 41	23 39	24 38	0 38
35	17 38	19 02	22 25	23 25	24 27	0 27
40	17 33	19 03	22 07	23 09	24 14	0 14
45	17 27	19 05	21 44	22 50	23 59	25 09
50	17 21	19 09	21 16	22 26	23 40	24 56
52	17 17	19 09	21 02	22 14	23 31	24 50
54	17 14	19 12	20 45	22 01	23 21	24 43
56	17 10	19 14	20 26	21 45	23 10	24 35
58	17 06	19 17	20 02	21 27	22 56	24 26
60	17 01	19 20	19 29	21 04	22 41	24 16
S						

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb	Venus	Mars
°	′	′	′
0			
	0.3	0.1	0.1
30			
	0.3	0.1	0.0
45			
	0.3	0.1	0.0
60			
	0.3	0.0	0.0
75			
	0.3	0.0	0.0
90			

Moon's Lower Limb
Add

Alt.	13	14	15
°	′	′	′
0			
	12.1	12.5	13.1
4			
	12.1	12.5	13.1
8			
	12.2	12.5	13.2
12			
	12.2	12.6	13.2
16			
	12.2	12.6	13.2
20			
	12.3	12.7	13.3
24			
	12.4	12.7	13.3
28			
	12.5	12.8	13.4
32			
	12.6	12.9	13.5
36			
	12.7	13.0	13.5
40			
	12.8	13.1	13.6
44			
	12.9	13.2	13.7
48			
	13.1	13.4	13.8
52			
	13.2	13.5	13.9
56			
	13.4	13.6	14.0
60			
	13.5	13.8	14.1
64			
	13.7	13.9	14.3
68			
	13.9	14.1	14.4
72			
	14.1	14.2	14.5
76			
	14.3	14.4	14.6
80			
	14.4	14.6	14.8
84			
	14.6	14.7	14.9
88			
	14.8	14.9	15.0
90			

Add to table, back cover

Moon's Upper Limb
Subtract

Alt.	13	14	15
°	′	′	′
0			
	17.5	17.3	16.9
4			
	17.5	17.3	16.9
8			
	17.5	17.3	16.9
12			
	17.4	17.2	16.9
16			
	17.4	17.2	16.8
20			
	17.3	17.1	16.8
24			
	17.2	17.1	16.7
28			
	17.2	17.0	16.7
32			
	17.1	16.9	16.6
36			
	16.9	16.8	16.5
40			
	16.8	16.7	16.4
44			
	16.7	16.6	16.4
48			
	16.6	16.4	16.3
52			
	16.4	16.3	16.2
56			
	16.2	16.2	16.0
60			
	16.1	16.0	15.9
64			
	15.9	15.9	15.8
68			
	15.7	15.7	15.7
72			
	15.6	15.6	15.6
76			
	15.4	15.4	15.4
80			
	15.2	15.2	15.3
84			
	15.0	15.1	15.2
88			
	14.9	14.9	15.1
90			

Subtract from table, back cover

Equation of Time (App.—Mean)

GCT	13	14	15
h	m s	m s	m s
0	− 0 51.2	− 0 35.7	− 0 20.5
6	− 0 47.3	− 0 31.9	− 0 16.7
12	− 0 43.4	− 0 28.0	− 0 13.0
18	− 0 39.5	− 0 24.2	− 0 09.3
24	− 0 35.7	− 0 20.5	− 0 05.6

GCT of Transit Meridian of Greenwich

DAY	Moon	Venus	Mars	Jupiter	Saturn
	h m	h m	h m	h m	h m
13	17 39	14 18	12 37	10 32	22 28
14	18 29	14 19	12 36	10 29	22 24
15	19 18	14 20	12 35	10 25	22 20
16	20 04	14 21	12 34	10 22	22 16

First Quarter 14

GCT	♈ GHA	VENUS −3.5 GHA	VENUS Dec.	MARS 1.5 GHA	MARS Dec.	JUPITER −1.6 GHA	JUPITER Dec.	SATURN 0.9 GHA	SATURN Dec.	MOON GHA	code	MOON Dec.	code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
0	203 19.8	144 59.7	+21 31.9	171 22.2	+12 45.0	204 04.6	− 1 29.1	25 03.0	+ 3 29.8	68 22.4	125	+20 18.8	−109
1	218 22.3	159 59.0	32.6	186 22.9	45.7	219 06.6	28.9	40 05.6	29.9	82 53.9	127	20 07.9	−110
2	233 24.8	174 58.4	33.4	201 23.6	46.3	234 08.5	28.6	55 08.2	29.9	97 25.6	126	19 56.9	−110
3	248 27.2	189 57.8	•• 34.1	216 24.3	•• 47.0	249 10.4	•• 28.4	70 10.8	•• 30.0	111 57.2	128	·19 45.9	−112
4	263 29.7	204 57.1	34.8	231 25.0	47.6	264 12.4	28.2	85 13.5	30.0	126 29.0	127	19 34.7	−113
5	278 32.2	219 56.5	35.6	246 25.7	48.3	279 14.3	28.0	100 16.1	30.1	141 00.7	128	19 23.4	−114
6	293 34.6	234 55.9	+21 36.3	261 26.3	+12 48.9	294 16.3	− 1 27.7	115 18.7	+ 3 30.2	155 32.5	128	+19 12.0	−115
7	308 37.1	249 55.3	37.0	276 27.0	49.6	309 18.2	27.5	130 21.3	30.2	170 04.3	129	19 00.5	−116
8	323 39.5	264 54.6	37.8	291 27.7	50.2	324 20.1	27.3	145 23.9	30.3	184 36.2	129	18 48.9	−116
9	338 42.0	279 54.0	•• 38.5	306 28.4	•• 50.8	339 22.1	•• 27.1	160 26.5	•• 30.3	199 08.1	129	·18 37.3	−118
10	353 44.5	294 53.4	39.2	321 29.1	51.5	354 24.0	26.8	175 29.1	30.4	213 40.0	130	18 25.5	−119
11	8 46.9	309 52.7	40.0	336 29.8	52.1	9 25.9	26.6	190 31.7	30.5	228 12.0	130	18 13.6	−119
12	23 49.4	324 52.1	+21 40.7	351 30.5	+12 52.8	24 27.9	− 1 26.4	205 34.4	+ 3 30.5	242 44.0	130	+18 01.7	−121
13	38 51.9	339 51.5	41.4	6 31.2	53.4	39 29.8	26.2	220 37.0	30.6	257 16.0	131	17 49.6	−121
14	53 54.3	354 50.8	42.2	21 31.8	54.1	54 31.7	26.0	235 39.6	30.6	271 48.1	131	17 37.5	−122
15	68 56.8	9 50.2	•• 42.9	36 32.5	•• 54.7	69 33.7	•• 25.7	250 42.2	•• 30.7	286 20.2	132	·17 25.3	−124
16	83 59.3	24 49.6	43.6	51 33.2	55.4	84 35.6	25.5	265 44.8	30.8	300 52.4	131	17 12.9	−124
17	99 01.7	39 49.0	44.3	66 33.9	56.0	99 37.6	25.3	280 47.4	30.8	315 24.5	132	17 00.5	−125
18	114 04.2	54 48.3	+21 45.1	81 34.6	+12 56.7	114 39.5	− 1 25.1	295 50.0	+ 3 30.9	329 56.7	133	+16 48.0	−126
19	129 06.7	69 47.7	45.8	96 35.3	57.3	129 41.4	24.8	310 52.6	30.9	344 29.0	133	16 35.4	−126
20	144 09.1	84 47.1	46.5	111 36.0	58.0	144 43.4	24.6	325 55.2	31.0	359 01.3	133	16 22.8	−128
21	159 11.6	99 46.4	•• 47.2	126 36.6	•• 58.6	159 45.3	•• 24.4	340 57.9	•• 31.0	13 33.6	133	·16 10.0	−129
22	174 14.0	114 45.8	47.9	141 37.3	59.3	174 47.3	24.2	356 00.5	31.1	28 05.9	133	15 57.1	−129
23	189 16.5	129 45.1	48.7	156 38.0	12 59.9	189 49.2	23.9	11 03.1	31.2	42 38.2	134	15 44.2	−130
0	204 19.0	144 44.5	+21 49.4	171 38.7	+13 00.5	204 51.1	− 1 23.7	26 05.7	+ 3 31.2	57 10.6	134	+15 31.2	−131
1	219 21.4	159 43.9	50.1	186 39.4	01.2	219 53.1	23.5	41 08.3	31.3	71 43.0	135	15 18.1	−132
2	234 23.9	174 43.2	50.8	201 40.1	01.8	234 55.0	23.3	56 10.9	31.3	86 15.5	134	15 04.9	−133
3	249 26.4	189 42.6	•• 51.5	216 40.8	•• 02.5	249 56.9	•• 23.1	71 13.5	•• 31.4	100 47.9	135	·14 51.6	−133
4	264 28.8	204 42.0	52.2	231 41.5	03.1	264 58.9	22.8	86 16.1	31.5	115 20.4	135	14 38.3	−134
5	279 31.3	219 41.3	53.0	246 42.1	03.8	280 00.8	22.6	101 18.7	31.5	129 52.9	136	14 24.9	−135
6	294 33.8	234 40.7	+21 53.7	261 42.8	+13 04.4	295 02.8	− 1 22.4	116 21.4	+ 3 31.6	144 25.5	135	+14 11.4	−136
7	309 36.2	249 40.1	54.4	276 43.5	05.1	310 04.7	22.2	131 24.0	31.6	158 58.0	136	13 57.8	−137
8	324 38.7	264 39.4	55.1	291 44.2	05.7	325 06.6	21.9	146 26.6	31.7	173 30.6	136	13 44.1	−137
9	339 41.1	279 38.8	•• 55.8	306 44.9	•• 06.3	340 08.6	•• 21.7	161 29.2	•• 31.8	188 03.2	136	·13 30.4	−139
10	354 43.6	294 38.1	56.5	321 45.6	07.0	355 10.5	21.5	176 31.8	31.8	202 35.8	136	13 16.5	−138
11	9 46.1	309 37.5	57.2	336 46.3	07.6	10 12.5	21.3	191 34.4	31.9	217 08.4	137	13 02.7	−140
12	24 48.5	324 36.9	+21 57.9	351 46.9	+13 08.3	25 14.4	− 1 21.0	206 37.0	+ 3 31.9	231 41.1	137	+12 48.7	−141
13	39 51.0	339 36.2	58.6	6 47.6	08.9	40 16.3	20.8	221 39.6	32.0	246 13.8	137	12 34.6	−141
14	54 53.5	354 35.6	21 59.3	21 48.3	09.6	55 18.3	20.6	236 42.2	32.0	260 46.5	137	12 20.5	−142
15	69 55.9	9 35.0	·22 00.0	36 49.0	•• 10.2	70 20.2	•• 20.4	251 44.8	•• 32.1	275 19.2	137	·12 06.3	−142
16	84 58.4	24 34.3	00.7	51 49.7	10.8	85 22.2	20.2	266 47.5	32.2	289 51.9	137	11 52.1	−143
17	100 00.9	39 33.7	01.4	66 50.4	11.5	100 24.1	19.9	281 50.1	32.2	304 24.6	137	11 37.8	−144
18	115 03.3	54 33.0	+22 02.1	81 51.1	+13 12.1	115 26.0	− 1 19.7	296 52.7	+ 3 32.3	318 57.3	138	+11 23.4	−145
19	130 05.8	69 32.4	02.8	96 51.7	12.8	130 28.0	19.5	311 55.3	32.3	333 30.1	138	11 08.9	−145
20	145 08.3	84 31.7	03.5	111 52.4	13.4	145 29.9	19.3	326 57.9	32.4	348 02.9	137	10 54.4	−146
21	160 10.7	99 31.1	•• 04.2	126 53.1	•• 14.0	160 31.9	•• 19.0	342 00.5	•• 32.5	2 35.6	138	·10 39.8	−147
22	175 13.2	114 30.5	04.9	141 53.8	14.7	175 33.8	18.8	357 03.1	32.5	17 08.4	138	10 25.1	−147
23	190 15.6	129 29.8	05.6	156 54.5	15.3	190 35.7	18.6	12 05.7	32.6	31 41.2	138	10 10.4	−148
0	205 18.1	144 29.2	+22 06.3	171 55.2	+13 16.0	205 37.7	− 1 18.4	27 08.3	+ 3 32.6	46 14.0	138	+ 9 55.6	−149
1	220 20.6	159 28.5	07.0	186 55.8	16.6	220 39.6	18.2	42 10.9	32.7	60 46.8	138	9 40.7	−149
2	235 23.0	174 27.9	07.7	201 56.5	17.2	235 41.6	17.9	57 13.5	32.7	75 19.6	138	9 25.8	−150
3	250 25.5	189 27.2	•• 08.4	216 57.2	•• 17.9	250 43.5	•• 17.7	72 16.2	•• 32.8	89 52.4	138	· 9 10.8	−150
4	265 28.0	204 26.6	09.1	231 57.9	18.5	265 45.4	17.5	87 18.8	32.9	104 25.2	138	8 55.8	−151
5	280 30.4	219 26.0	09.8	246 58.6	19.1	280 47.4	17.3	102 21.4	32.9	118 58.0	138	8 40.7	−152
6	295 32.9	234 25.3	+22 10.5	261 59.3	+13 19.8	295 49.3	− 1 17.0	117 24.0	+ 3 33.0	133 30.8	139	+ 8 25.5	−152
7	310 35.4	249 24.7	11.2	277 00.0	20.4	310 51.3	16.8	132 26.6	33.0	148 03.7	138	8 10.3	−152
8	325 37.8	264 24.0	11.9	292 00.6	21.1	325 53.2	16.6	147 29.2	33.1	162 36.5	138	7 55.1	−154
9	340 40.3	279 23.4	•• 12.5	307 01.3	•• 21.7	340 55.1	•• 16.4	162 31.8	•• 33.1	177 09.3	138	· 7 39.7	−154
10	355 42.8	294 22.7	13.2	322 02.0	22.3	355 57.1	16.2	177 34.4	33.2	191 42.1	138	7 24.3	−154
11	10 45.2	309 22.1	13.9	337 02.7	23.0	10 59.0	15.9	192 37.0	33.3	206 14.9	138	7 08.9	−155
12	25 47.7	324 21.4	+22 14.6	352 03.4	+13 23.6	26 01.0	− 1 15.7	207 39.6	+ 3 33.3	220 47.7	137	+ 6 53.4	−155
13	40 50.1	339 20.8	15.3	7 04.1	24.2	41 02.9	15.5	222 42.2	33.4	235 20.4	138	6 37.9	−156
14	55 52.6	354 20.1	15.9	22 04.7	24.9	56 04.8	15.3	237 44.8	33.4	249 53.2	138	6 22.3	−156
15	70 55.1	9 19.5	•• 16.6	37 05.4	•• 25.5	71 06.8	•• 15.0	252 47.4	•• 33.5	264 26.0	137	· 6 06.7	−157
16	85 57.5	24 18.8	17.3	52 06.1	26.1	86 08.7	14.8	267 50.1	33.5	278 58.7	138	5 51.0	−157
17	101 00.0	39 18.2	18.0	67 06.8	26.8	101 10.7	14.6	282 52.7	33.6	293 31.5	137	5 35.3	−158
18	116 02.5	54 17.6	+22 18.7	82 07.5	+13 27.4	116 12.6	− 1 14.4	297 55.3	+ 3 33.7	308 04.2	137	+ 5 19.5	−158
19	131 04.9	69 16.9	19.3	97 08.2	28.1	131 14.6	14.2	312 57.9	33.7	322 36.9	137	5 03.7	−159
20	146 07.4	84 16.3	20.0	112 08.8	28.7	146 16.5	13.9	328 00.5	33.8	337 09.6	137	4 47.8	−159
21	161 09.9	99 15.6	•• 20.7	127 09.5	•• 29.3	161 18.4	•• 13.7	343 03.1	•• 33.8	351 42.3	137	· 4 31.9	−159
22	176 12.3	114 15.0	21.4	142 10.2	30.0	176 20.4	13.5	358 05.7	33.9	6 15.0	136	4 16.0	−160
23	191 14.8	129 14.3	22.0	157 10.9	30.6	191 22.3	13.3	13 08.3	33.9	20 47.6	136	4 00.0	−161
24	206 17.2	144 13.7	+22 22.7	172 11.6	+13 31.2	206 24.3	− 1 13.1	28 10.9	+ 3 34.0	35 20.2	136	+ 3 43.9	−160
code	—	− 7	+ 7	+ 7	+ 6	+ 19	+ 2	+ 26	+ 1				

GCT	SUN GHA	SUN Dec.
h	° ′	° ′
0	179 58.7	+ 9 45.4
1	194 58.8	46.3
2	209 59.0	47.1
3	224 59.1	·· 48.0
4	239 59.3	48.9
5	254 59.4	49.8
6	269 59.6	+ 9 50.7
7	284 59.7	51.6
8	299 59.9	52.5
9	315 00.1	·· 53.4
10	330 00.2	54.3
11	345 00.4	55.2
12	0 00.5	+ 9 56.1
13	15 00.7	57.0
14	30 00.8	57.8
15	45 01.0	·· 58.7
16	60 01.1	9 59.6
17	75 01.3	10 00.5
18	90 01.4	+10 01.4
19	105 01.6	02.3
20	120 01.7	03.2
21	135 01.9	·· 04.1
22	150 02.0	04.9
23	165 02.2	05.8
0	180 02.3	+10 06.7
1	195 02.5	07.6
2	210 02.6	08.5
3	225 02.8	·· 09.4
4	240 02.9	10.3
5	255 03.1	11.2
6	270 03.2	+10 12.0
7	285 03.4	12.9
8	300 03.5	13.8
9	315 03.7	·· 14.7
10	330 03.8	15.6
11	345 04.0	16.5
12	0 04.1	+10 17.3
13	15 04.2	18.2
14	30 04.4	19.1
15	45 04.5	·· 20.0
16	60 04.7	20.9
17	75 04.8	21.8
18	90 05.0	+10 22.6
19	105 05.1	23.5
20	120 05.3	24.4
21	135 05.4	·· 25.3
22	150 05.6	26.2
23	165 05.7	27.0
0	180 05.9	+10 27.9
1	195 06.0	28.8
2	210 06.2	29.7
3	225 06.3	·· 30.6
4	240 06.4	31.4
5	255 06.6	32.3
6	270 06.7	+10 33.2
7	285 06.9	34.1
8	300 07.0	34.9
9	315 07.2	·· 35.8
10	330 07.3	36.7
11	345 07.5	37.6
12	0 07.6	+10 38.5
13	15 07.7	39.3
14	30 07.9	40.2
15	45 08.0	·· 41.1
16	60 08.2	42.0
17	75 08.3	42.8
18	90 08.5	+10 43.7
19	105 08.6	44.6
20	120 08.8	45.4
21	135 08.9	·· 46.3
22	150 09.0	47.2
23	165 09.2	48.1
24	180 09.3	+10 48.9
code	—	+ 9

STARS No.	SHA	Dec.	Transit Mer. Gr.
	° ′	° ′	h m
1	358 32.4	+28 49.1	10 27
2	358 22.3	+58 52.7	10 28
3	349 43.0	−18 15.3	11 02
4	339 21.7	+59 58.9	11 43
5	336 01.8	−57 29.0	11 57
6	333 01.6	+89 02.2	12 09
7	328 54.0	+23 14.0	12 25
8	315 54.1	−40 30.0	13 17
9	309 48.0	+49 41.5	13 41
10	291 43.4	+16 24.9	14 53
11	281 57.2	− 8 15.4	15 32
12	281 44.0	+45 57.3	15 33
13	279 22.4	+ 6 18.5	15 43
14	279 12.0	+28 34.3	15 43
15	276 34.0	− 1 13.9	15 54
16	271 52.1	+ 7 24.1	16 13
17	264 17.2	−52 40.2	16 43
18	259 15.1	−16 38.9	17 03
19	255 49.4	−28 54.4	17 17
20	245 48.7	+ 5 21.1	17 57
21	244 24.9	+28 08.9	18 02
22	234 37.3	−59 21.3	18 41
23	223 26.9	−43 14.3	19 26
24	221 49.9	−69 31.2	19 32
25	218 42.0	− 8 26.9	19 45
26	208 33.1	+12 12.4	20 25
27	194 48.1	+62 01.0	21 20
28	183 21.0	+14 50.6	22 06
29	174 01.4	−62 50.0	22 43
30	172 52.9	−56 50.6	22 47
31	168 46.7	−59 25.6	23 04
32	167 00.8	+56 13.4	23 11
33	159 29.7	+55 10.7	23 41
34	159 20.3	−10 54.7	23 41
35	153 35.0	+49 33.2	0 08
36	149 02.5	−36 08.1	0 26
37	146 38.0	+19 25.9	0 36
38	140 55.4	−60 38.3	0 59
39	137 16.1	+74 21.1	1 13
40	126 50.2	+26 52.4	1 55
41	120 38.0	−22 29.3	2 20
42	113 23.4	−26 19.7	2 49
43	109 07.1	−68 56.5	3 06
44	103 06.0	−15 40.2	3 30
45	97 25.2	−37 04.3	3 52
46	96 49.7	+12 35.3	3 55
47	91 07.6	+51 29.2	4 18
48	84 45.7	−34 24.7	4 43
49	81 10.5	+38 43.8	4 57
50	76 56.1	−26 21.7	5 14
51	62 53.9	+ 8 44.0	6 10
52	54 32.8	−56 53.5	6 43
53	50 03.6	+45 05.9	7 01
54	34 33.2	+ 9 38.8	8 03
55	28 42.5	−47 11.8	8 27
56	16 15.7	−29 52.9	9 16
57	14 25.2	+14 56.4	9 24

Lat.	Sunrise	Twlt. begins	Moonrise 16	17	18	19
N °	h m	h m	h m	h m	h m	h m
70	3 50	////	9 18	12 01	14 11	16 18
68	4 04	////	10 06	12 19	14 19	16 17
66	4 15	////	10 36	12 34	14 26	16 16
64	4 25	////	10 59	12 47	14 31	16 16
62	4 33	////	11 16	12 57	14 35	16 15
60	4 40	1 23	11 31	13 06	14 39	16 14
58	4 46	1 56	11 44	13 13	14 43	16 14
56	4 51	2 19	11 54	13 20	14 46	16 14
54	4 56	2 37	12 04	13 26	14 49	16 13
52	5 01	2 51	12 12	13 31	14 51	16 13
50	5 05	3 03	12 20	13 36	14 53	16 13
45	5 13	3 27	12 35	13 47	14 58	16 12
40	5 20	3 45	12 48	13 55	15 02	16 11
35	5 27	3 59	12 59	14 02	15 06	16 11
30	5 32	4 10	13 09	14 09	15 09	16 11
20	5 41	4 26	13 26	14 20	15 14	16 10
10	5 49	4 39	13 40	14 30	15 19	16 09
0	5 56	4 47	13 53	14 39	15 24	16 09
10	6 04	4 53	14 06	14 48	15 28	16 09
20	6 11	4 57	14 20	14 57	15 33	16 08
30	6 20	4 59	14 36	15 08	15 38	16 08
35	6 25	5 00	14 46	15 14	15 41	16 07
40	6 30	4 59	14 56	15 21	15 44	16 07
45	6 37	4 58	15 09	15 29	15 48	16 07
50	6 44	4 55	15 24	15 39	15 53	16 06
52	6 48	4 54	15 31	15 44	15 55	16 06
54	6 52	4 52	15 38	15 49	15 57	16 06
56	6 56	4 50	15 47	15 54	16 00	16 06
58	7 01	4 48	15 56	16 00	16 03	16 05
60	7 06	4 45	16 07	16 07	16 06	16 05
S						

Lat.	Sunset	Twlt. ends	Moonset 16	17	18	19
N °	h m	h m	h m	h m	h m	h m
70	20 13	////	6 24	5 18	4 42	4 14
68	19 59	////	5 35	4 57	4 32	4 11
66	19 47	////	5 03	4 40	4 23	4 09
64	19 37	////	4 40	4 27	4 16	4 07
62	19 28	////	4 21	4 15	4 10	4 05
60	19 21	22 46	4 05	4 05	4 04	4 03
58	19 15	22 11	3 52	3 56	3 59	4 02
56	19 09	21 46	3 40	3 49	3 55	4 01
54	19 04	21 28	3 30	3 42	3 51	4 00
52	19 00	21 13	3 21	3 36	3 48	3 59
50	18 56	21 00	3 13	3 30	3 44	3 58
45	18 47	20 36	2 56	3 18	3 37	3 56
40	18 40	20 18	2 41	3 08	3 31	3 54
35	18 33	20 03	2 29	2 59	3 26	3 53
30	18 28	19 52	2 19	2 51	3 22	3 51
20	18 19	19 35	2 00	2 38	3 14	3 49
10	18 11	19 22	1 44	2 26	3 07	3 47
0	18 03	19 13	1 29	2 15	3 00	3 45
10	17 56	19 07	1 14	2 04	2 53	3 43
20	17 48	19 02	0 57	1 52	2 46	3 41
30	17 39	18 59	0 38	1 38	2 38	3 38
35	17 34	18 58	0 27	1 30	2 33	3 37
40	17 29	18 59	0 14	1 20	2 27	3 35
45	17 22	19 00	25 09	1 09	2 21	3 33
50	17 14	19 02	24 56	0 56	2 13	3 31
52	17 11	19 04	24 50	0 50	2 09	3 30
54	17 07	19 05	24 43	0 43	2 05	3 29
56	17 03	19 07	24 35	0 35	2 01	3 27
58	16 58	19 09	24 26	0 26	1 56	3 26
60	16 52	19 11	24 16	0 16	1 50	3 24
S						

GCT	Equation of Time (App.—Mean) 16	17	18
h	m s	m s	m s
0	− 0 05.6	+ 0 09.0	+ 0 23.2
6	− 0 01.9	+ 0 12.6	+ 0 26.7
12	+ 0 01.7	+ 0 16.1	+ 0 30.1
18	+ 0 05.4	+ 0 19.7	+ 0 33.6
24	+ 0 09.0	+ 0 23.2	+ 0 37.0

GCT of Transit Meridian of Greenwich

DAY	Moon	Venus	Mars	Jupiter	Saturn
	h m	h m	h m	h m	h m
16	20 04	14 21	12 34	10 22	22 16
17	20 49	14 22	12 33	10 19	22 12
18	21 34	14 23	12 32	10 16	22 08
19	22 20	14 24	12 31	10 13	22 04

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb	Venus	Mars
°	′	′	′
0			
	0.3	0.1	0.1
30			
	0.3	0.1	0.0
45			
	0.3	0.1	0.0
60			
	0.3	0.0	0.0
75			
	0.3	0.0	0.0
90			

Moon's Lower Limb

Add

Alt.	16	17	18
°	′	′	′
0			
	14.0	15.0	16.1
4			
	14.0	15.0	16.1
8			
	14.0	15.0	16.1
12			
	14.1	15.1	16.0
16			
	14.1	15.1	16.0
20			
	14.1	15.1	16.0
24			
	14.1	15.1	16.0
28			
	14.2	15.1	16.0
32			
	14.2	15.1	16.0
36			
	14.3	15.1	16.0
40			
	14.3	15.1	16.0
44			
	14.4	15.2	15.9
48			
	14.5	15.2	15.9
52			
	14.5	15.2	15.9
56			
	14.6	15.2	15.9
60			
	14.7	15.3	15.8
64			
	14.7	15.3	15.8
68			
	14.8	15.3	15.8
72			
	14.9	15.3	15.8
76			
	15.0	15.4	15.7
80			
	15.1	15.4	15.7
84			
	15.1	15.4	15.7
88			
	15.2	15.4	15.7
90			

Add to table, back cover

Moon's Upper Limb

Subtract

Alt.	16	17	18
°	′	′	′
0			
	16.4	15.8	15.3
4			
	16.4	15.8	15.3
8			
	16.4	15.8	15.3
12			
	16.4	15.8	15.3
16			
	16.4	15.8	15.3
20			
	16.3	15.8	15.3
24			
	16.3	15.8	15.3
28			
	16.3	15.8	15.3
32			
	16.2	15.8	15.3
36			
	16.2	15.8	15.3
40			
	16.1	15.7	15.4
44			
	16.1	15.7	15.4
48			
	16.0	15.7	15.4
52			
	15.9	15.7	15.4
56			
	15.9	15.7	15.4
60			
	15.8	15.6	15.5
64			
	15.7	15.6	15.5
68			
	15.6	15.6	15.5
72			
	15.6	15.6	15.5
76			
	15.5	15.5	15.6
80			
	15.4	15.5	15.6
84			
	15.3	15.5	15.6
88			
	15.2	15.4	15.7
90			

Subtract from table, back cover

1951 APRIL 19, 20, 21, (THU., FRI., SAT.)

GCT	♈ GHA	VENUS −3.5 GHA	VENUS Dec.	MARS 1.5 GHA	MARS Dec.	JUPITER −1.6 GHA	JUPITER Dec.	SATURN 1.0 GHA	SATURN Dec.	MOON GHA	code	MOON Dec.	code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
0	206 17.2	144 13.7	+22 22.7	172 11.6	+13 31.2	206 24.3	− 1 13.1	28 10.9	+ 3 34.0	35 20.2	136	+ 3 43.9	−160
1	221 19.7	159 13.0	23.4	187 12.3	31.9	221 26.2	12.8	43 13.5	34.1	49 52.8	136	3 27.9	−161
2	236 22.2	174 12.4	24.0	202 12.9	32.5	236 28.2	12.6	58 16.1	34.1	64 25.4	136	3 11.8	−162
3	251 24.6	189 11.7	•• 24.7	217 13.6	•• 33.1	251 30.1	•• 12.4	73 18.7	•• 34.2	78 58.0	135	• 2 55.6	−161
4	266 27.1	204 11.0	25.4	232 14.3	33.8	266 32.0	12.2	88 21.3	34.2	93 30.5	135	2 39.5	−162
5	281 29.6	219 10.4	26.0	247 15.0	34.4	281 34.0	11.9	103 23.9	34.3	108 03.0	135	2 23.3	−163
6	296 32.0	234 09.7	+22 26.7	262 15.7	+13 35.0	296 35.9	− 1 11.7	118 26.5	+ 3 34.3	122 35.5	134	+ 2 07.0	−162
7	311 34.5	249 09.1	27.4	277 16.3	35.6	311 37.9	11.5	133 29.1	34.4	137 07.9	135	1 50.8	−163
8	326 37.0	264 08.4	28.0	292 17.0	36.3	326 39.8	11.3	148 31.8	34.5	151 40.4	134	1 34.5	−164
9	341 39.4	279 07.8	•• 28.7	307 17.7	•• 36.9	341 41.8	•• 11.1	163 34.4	•• 34.5	166 12.8	133	• 1 18.1	−163
10	356 41.9	294 07.1	29.3	322 18.4	37.5	356 43.7	10.8	178 37.0	34.6	180 45.1	133	1 01.8	−164
11	11 44.4	309 06.5	30.0	337 19.1	38.2	11 45.6	10.6	193 39.6	34.6	195 17.4	133	0 45.4	−164
12	26 46.8	324 05.8	+22 30.7	352 19.8	+13 38.8	26 47.6	− 1 10.4	208 42.2	+ 3 34.7	209 49.7	133	+ 0 29.0	−164
13	41 49.3	339 05.2	31.3	7 20.4	39.4	41 49.5	10.2	223 44.8	34.7	224 22.0	132	+ 0 12.6	−165
14	56 51.7	354 04.5	32.0	22 21.1	40.1	56 51.5	10.0	238 47.4	34.8	238 54.2	132	− 0 03.9	−164
15	71 54.2	9 03.9	•• 32.6	37 21.8	•• 40.7	71 53.4	•• 09.7	253 50.0	•• 34.8	253 26.4	131	• 0 20.3	−165
16	86 56.7	24 03.2	33.3	52 22.5	41.3	86 55.4	09.5	268 52.6	34.9	267 58.5	131	0 36.8	−165
17	101 59.1	39 02.5	33.9	67 23.2	42.0	101 57.3	09.3	283 55.2	35.0	282 30.6	130	0 53.3	−165
18	117 01.6	54 01.9	+22 34.6	82 23.9	+13 42.6	116 59.2	− 1 09.1	298 57.8	+ 3 35.0	297 02.6	130	− 1 09.8	−166
19	132 04.1	69 01.2	35.2	97 24.5	43.2	132 01.2	08.9	314 00.4	35.1	311 34.6	130	1 26.4	−165
20	147 06.5	84 00.6	35.9	112 25.2	43.8	147 03.1	08.6	329 03.0	35.1	326 06.6	129	1 42.9	−166
21	162 09.0	98 59.9	•• 36.5	127 25.9	•• 44.5	162 05.1	•• 08.4	344 05.6	•• 35.2	340 38.5	129	• 1 59.5	−165
22	177 11.5	113 59.3	37.2	142 26.6	45.1	177 07.0	08.2	359 08.2	35.2	355 10.4	128	2 16.0	−166
23	192 13.9	128 58.6	37.8	157 27.3	45.7	192 09.0	08.0	14 10.8	35.3	9 42.2	127	2 32.6	−166
0	207 16.4	143 57.9	+22 38.5	172 27.9	+13 46.3	207 10.9	− 1 07.7	29 13.4	+ 3 35.3	24 13.9	127	− 2 49.2	−166
1	222 18.8	158 57.3	39.1	187 28.6	47.0	222 12.8	07.5	44 16.0	35.4	38 45.6	127	3 05.8	−166
2	237 21.3	173 56.6	39.8	202 29.3	47.6	237 14.8	07.3	59 18.6	35.5	53 17.3	126	3 22.4	−166
3	252 23.8	188 56.0	•• 40.4	217 30.0	•• 48.2	252 16.7	•• 07.1	74 21.2	•• 35.5	67 48.9	126	• 3 39.0	−166
4	267 26.2	203 55.3	41.0	232 30.7	48.9	267 18.7	06.9	89 23.8	35.6	82 20.5	125	3 55.6	−166
5	282 28.7	218 54.6	41.7	247 31.3	49.5	282 20.6	06.6	104 26.4	35.6	96 52.0	124	4 12.2	−166
6	297 31.2	233 54.0	+22 42.3	262 32.0	+13 50.1	297 22.6	− 1 06.4	119 29.0	+ 3 35.7	111 23.4	124	− 4 28.8	−166
7	312 33.6	248 53.3	43.0	277 32.7	50.7	312 24.5	06.2	134 31.6	35.7	125 54.8	123	4 45.4	−166
8	327 36.1	263 52.7	43.6	292 33.4	51.4	327 26.5	06.0	149 34.2	35.8	140 26.1	122	5 02.0	−166
9	342 38.6	278 52.0	•• 44.2	307 34.1	•• 52.0	342 28.4	•• 05.8	164 36.8	•• 35.8	154 57.3	122	• 5 18.6	−166
10	357 41.0	293 51.3	44.9	322 34.7	52.6	357 30.3	05.5	179 39.4	35.9	169 28.5	121	5 35.2	−166
11	12 43.5	308 50.7	45.5	337 35.4	53.2	12 32.3	05.3	194 42.1	36.0	183 59.6	121	5 51.8	−165
12	27 46.0	323 50.0	+22 46.1	352 36.1	+13 53.9	27 34.2	− 1 05.1	209 44.7	+ 3 36.0	198 30.7	120	− 6 08.3	−166
13	42 48.4	338 49.4	46.8	7 36.8	54.5	42 36.2	04.9	224 47.3	36.1	213 01.7	119	6 24.9	−165
14	57 50.9	353 48.7	47.4	22 37.5	55.1	57 38.1	04.7	239 49.9	36.1	227 32.6	118	6 41.4	−165
15	72 53.3	8 48.0	•• 48.0	37 38.2	•• 55.7	72 40.1	•• 04.4	254 52.5	•• 36.2	242 03.4	118	• 6 57.9	−165
16	87 55.8	23 47.4	48.7	52 38.8	56.4	87 42.0	04.2	269 55.1	36.2	256 34.2	117	7 14.4	−165
17	102 58.3	38 46.7	49.3	67 39.5	57.0	102 44.0	04.0	284 57.7	36.3	271 04.9	116	7 30.9	−165
18	118 00.7	53 46.0	+22 49.9	82 40.2	+13 57.6	117 45.9	− 1 03.8	300 00.3	+ 3 36.3	285 35.5	116	− 7 47.4	−164
19	133 03.2	68 45.4	50.5	97 40.9	58.2	132 47.8	03.6	315 02.9	36.4	300 06.1	115	8 03.8	−164
20	148 05.7	83 44.7	51.2	112 41.6	58.8	147 49.8	03.3	330 05.5	36.4	314 36.6	114	8 20.2	−164
21	163 08.1	98 44.0	•• 51.8	127 42.2	•13 59.5	162 51.7	•• 03.1	345 08.1	•• 36.5	329 07.0	113	• 8 36.6	−164
22	178 10.6	113 43.4	52.4	142 42.9	14 00.1	177 53.7	02.9	0 10.7	36.5	343 37.3	112	8 53.0	−163
23	193 13.1	128 42.7	53.0	157 43.6	00.7	192 55.6	02.7	15 13.3	36.6	358 07.5	112	9 09.3	−163
0	208 15.5	143 42.1	+22 53.7	172 44.3	+14 01.3	207 57.6	− 1 02.5	30 15.9	+ 3 36.7	12 37.7	111	− 9 25.6	−163
1	223 18.0	158 41.4	54.3	187 44.9	02.0	222 59.5	02.2	45 18.5	36.7	27 07.8	109	9 41.9	−162
2	238 20.5	173 40.7	54.9	202 45.6	02.6	238 01.5	02.0	60 21.1	36.8	41 37.7	110	9 58.1	−162
3	253 22.9	188 40.1	•• 55.5	217 46.3	•• 03.2	253 03.4	•• 01.8	75 23.7	•• 36.8	56 07.7	108	•10 14.3	−162
4	268 25.4	203 39.4	56.1	232 47.0	03.8	268 05.4	01.6	90 26.3	36.9	70 37.5	107	10 30.5	−161
5	283 27.8	218 38.7	56.7	247 47.7	04.4	283 07.3	01.4	105 28.9	36.9	85 07.2	106	10 46.6	−161
6	298 30.3	233 38.1	+22 57.4	262 48.3	+14 05.1	298 09.3	− 1 01.1	120 31.5	+ 3 37.0	99 36.8	106	−11 02.7	−160
7	313 32.8	248 37.4	58.0	277 49.0	05.7	313 11.2	00.9	135 34.1	37.0	114 06.4	105	11 18.7	−160
8	328 35.2	263 36.7	58.6	292 49.7	06.3	328 13.1	00.7	150 36.7	37.1	128 35.9	103	11 34.7	−159
9	343 37.7	278 36.0	•• 59.2	307 50.4	•• 06.9	343 15.1	•• 00.5	165 39.3	•• 37.1	143 05.2	103	•11 50.6	−159
10	358 40.2	293 35.4	22 59.8	322 51.1	07.5	358 17.0	00.3	180 41.9	37.2	157 34.5	102	12 06.5	−158
11	13 42.6	308 34.7	23 00.4	337 51.7	08.2	13 19.0	1 00.1	195 44.5	37.2	172 03.7	101	12 22.3	−158
12	28 45.1	323 34.0	+23 01.0	352 52.4	+14 08.8	28 20.9	− 0 59.8	210 47.1	+ 3 37.3	186 32.8	100	−12 38.1	−157
13	43 47.6	338 33.4	01.6	7 53.1	09.4	43 22.9	59.6	225 49.7	37.4	201 01.8	99	12 53.8	−157
14	58 50.0	353 32.7	02.2	22 53.8	10.0	58 24.8	59.4	240 52.3	37.4	215 30.7	98	13 09.5	−156
15	73 52.5	8 32.0	•• 02.8	37 54.5	•• 10.6	73 26.8	•• 59.2	255 54.9	•• 37.5	229 59.5	96	•13 25.1	−155
16	88 54.9	23 31.4	03.4	52 55.1	11.2	88 28.7	59.0	270 57.5	37.5	244 28.1	96	13 40.6	−155
17	103 57.4	38 30.7	04.0	67 55.8	11.9	103 30.7	58.7	286 00.1	37.6	258 56.7	95	13 56.1	−154
18	118 59.9	53 30.0	+23 04.7	82 56.5	+14 12.5	118 32.6	− 0 58.5	301 02.7	+ 3 37.6	273 25.2	94	−14 11.5	−153
19	134 02.3	68 29.3	05.3	97 57.2	13.1	133 34.6	58.3	316 05.3	37.7	287 53.6	93	14 26.8	−153
20	149 04.8	83 28.7	05.9	112 57.8	13.7	148 36.5	58.1	331 07.9	37.7	302 21.9	92	14 42.1	−152
21	164 07.3	98 28.0	•• 06.4	127 58.5	•• 14.3	163 38.5	•• 57.9	346 10.5	•• 37.8	316 50.1	91	•14 57.3	−151
22	179 09.7	113 27.3	07.0	142 59.2	14.9	178 40.4	57.6	1 13.1	37.8	331 18.2	89	15 12.4	−150
23	194 12.2	128 26.7	07.6	157 59.9	15.6	193 42.4	57.4	16 15.7	37.9	345 46.1	89	15 27.4	−150
24	209 14.7	143 26.0	+23 08.2	173 00.6	+14 16.2	208 44.3	− 0 57.2	31 18.3	+ 3 37.9	0 14.0	87	−15 42.4	−148
code	—	− 6	+ 7	+ 7	+ 6	+ 20	+ 2	+ 26	+ 1				

GCT	SUN GHA	SUN Dec.
h	° ′	° ′
0	180 09.3	+10 48.9
1	195 09.5	49.8
2	210 09.6	50.7
3	225 09.7	51.6
4	240 09.9	52.4
5	255 10.0	53.3
6	270 10.2	+10 54.2
7	285 10.3	55.0
8	300 10.5	55.9
9	315 10.6	56.8
10	330 10.7	57.6
11	345 10.9	58.5
12	0 11.0	+10 59.4
13	15 11.2	11 00.3
14	30 11.3	01.1
15	45 11.4	02.0
16	60 11.6	02.9
17	75 11.7	03.7
18	90 11.9	+11 04.6
19	105 12.0	05.5
20	120 12.1	06.3
21	135 12.3	07.2
22	150 12.4	08.1
23	165 12.5	08.9
0	180 12.7	+11 09.8
1	195 12.8	10.6
2	210 13.0	11.5
3	225 13.1	12.4
4	240 13.2	13.2
5	255 13.4	14.1
6	270 13.5	+11 15.0
7	285 13.6	15.8
8	300 13.8	16.7
9	315 13.9	17.6
10	330 14.1	18.4
11	345 14.2	19.3
12	0 14.3	+11 20.1
13	15 14.5	21.0
14	30 14.6	21.9
15	45 14.7	22.7
16	60 14.9	23.6
17	75 15.0	24.4
18	90 15.1	+11 25.3
19	105 15.3	26.2
20	120 15.4	27.0
21	135 15.5	27.9
22	150 15.7	28.7
23	165 15.8	29.6
0	180 15.9	+11 30.4
1	195 16.1	31.3
2	210 16.2	32.2
3	225 16.3	33.0
4	240 16.5	33.9
5	255 16.6	34.7
6	270 16.7	+11 35.6
7	285 16.9	36.4
8	300 17.0	37.3
9	315 17.1	38.1
10	330 17.3	39.0
11	345 17.4	39.8
12	0 17.5	+11 40.7
13	15 17.7	41.6
14	30 17.8	42.4
15	45 17.9	43.3
16	60 18.1	44.1
17	75 18.2	45.0
18	90 18.3	+11 45.8
19	105 18.4	46.7
20	120 18.6	47.5
21	135 18.7	48.4
22	150 18.8	49.2
23	165 19.0	50.1
24	180 19.1	+11 50.9
code	—	+ 9

STARS No.	SHA	Dec.	Transit Mer. Gr.
	° ′	° ′	h m
1	358 32.4	+28 49.1	10 15
2	358 22.3	+58 52.7	10 16
3	349 43.0	−18 15.2	10 50
4	339 21.7	+59 58.9	11 32
5	336 01.8	−57 29.0	11 45
6	333 01.5	+89 02.2	11 57
7	328 54.0	+23 14.0	12 13
8	315 54.1	−40 30.0	13 05
9	309 48.0	+49 41.5	13 29
10	291 43.4	+16 24.9	14 42
11	281 57.2	− 8 15.4	15 21
12	281 44.0	+45 57.3	15 21
13	279 22.4	+ 6 18.5	15 31
14	279 12.0	+28 34.3	15 32
15	276 34.0	− 1 13.9	15 42
16	271 52.1	+ 7 24.1	16 01
17	264 17.2	−52 40.2	16 31
18	259 15.1	−16 38.9	16 51
19	255 49.4	−28 54.4	17 05
20	245 48.7	+ 5 21.1	17 45
21	244 24.9	+28 08.9	17 50
22	234 37.4	−59 21.3	18 29
23	223 26.9	−43 14.3	19 14
24	221 49.9	−69 31.2	19 20
25	218 42.0	− 8 26.9	19 33
26	208 33.1	+12 12.4	20 13
27	194 48.1	+62 01.0	21 08
28	183 21.0	+14 50.6	21 54
29	174 01.5	−62 50.0	22 31
30	172 52.9	−56 50.7	22 36
31	168 46.7	−59 25.6	22 52
32	167 00.8	+56 13.4	22 59
33	159 29.7	+55 10.7	23 29
34	159 20.3	−10 54.7	23 30
35	153 35.0	+49 33.2	23 53
36	149 02.5	−36 08.1	0 15
37	146 38.0	+19 25.9	0 24
38	140 55.4	−60 38.4	0 47
39	137 16.1	+74 21.1	1 02
40	126 50.2	+26 52.4	1 43
41	120 37.9	−22 29.3	2 08
42	113 23.4	−26 19.7	2 37
43	109 07.0	−68 56.5	2 54
44	103 06.0	−15 40.2	3 18
45	97 25.2	−37 04.3	3 41
46	96 49.7	+12 35.3	3 43
47	91 07.6	+51 29.2	4 06
48	84 45.7	−34 24.7	4 31
49	81 10.5	+38 43.8	4 45
50	76 56.1	−26 21.7	5 02
51	62 53.8	+ 8 44.0	5 58
52	54 32.7	−56 53.5	6 32
53	50 03.6	+45 05.9	6 50
54	34 33.2	+ 9 38.8	7 51
55	28 42.4	−47 11.8	8 15
56	16 15.6	−29 52.9	9 04
57	14 25.2	+14 56.4	9 12

Lat.	Sunrise	Twlt. begins	Moonrise 19	20	21	22
N °	h m	h m	h m	h m	h m	h m
70	3 34	////	16 18	18 31	21 05	■
68	3 51	////	16 17	18 20	20 39	23 52
66	4 03	////	16 16	18 12	20 19	22 51
64	4 14	////	16 16	18 05	20 03	22 17
62	4 23	////	16 15	17 59	19 50	21 52
60	4 31	0 55	16 14	17 53	19 39	21 32
58	4 38	1 39	16 14	17 49	19 29	21 16
56	4 44	2 05	16 14	17 45	19 21	21 03
54	4 49	2 25	16 13	17 41	19 14	20 51
52	4 54	2 41	16 13	17 38	19 07	20 41
50	4 59	2 55	16 13	17 35	19 01	20 32
45	5 08	3 20	16 12	17 28	18 48	20 12
40	5 16	3 40	16 11	17 23	18 38	19 57
35	5 23	3 54	16 11	17 19	18 29	19 44
30	5 29	4 06	16 11	17 15	18 22	19 33
20	5 39	4 24	16 10	17 08	18 08	19 13
10	5 48	4 36	16 09	17 02	17 57	18 57
0	5 56	4 46	16 09	16 56	17 47	18 41
10	6 04	4 53	16 09	16 51	17 36	18 26
20	6 12	4 58	16 08	16 45	17 25	18 10
30	6 21	5 01	16 08	16 39	17 12	17 51
35	6 27	5 01	16 07	16 35	17 05	17 41
40	6 33	5 02	16 07	16 31	16 57	17 28
45	6 40	5 01	16 07	16 26	16 48	17 14
50	6 49	4 59	16 06	16 20	16 36	16 57
52	6 52	4 58	16 06	16 18	16 31	16 49
54	6 57	4 57	16 06	16 15	16 25	16 40
56	7 01	4 56	16 06	16 12	16 19	16 30
58	7 07	4 54	16 05	16 08	16 12	16 18
60	7 13	4 51	16 05	16 04	16 04	16 05
S						

Lat.	Sunset	Twlt. ends	Moonset 19	20	21	22
N °	h m	h m	h m	h m	h m	h m
70	20 27	////	4 14	3 46	3 14	2 27
68	20 11	////	4 11	3 50	3 27	2 55
66	19 57	////	4 09	3 54	3 38	3 17
64	19 46	////	4 07	3 57	3 47	3 34
62	19 37	////	4 05	4 00	3 54	3 49
60	19 29	23 19	4 03	4 02	4 01	4 01
58	19 22	22 28	4 02	4 04	4 07	4 11
56	19 16	22 00	4 01	4 06	4 12	4 21
54	19 10	21 38	4 00	4 08	4 17	4 29
52	19 05	21 22	3 59	4 10	4 22	4 37
50	19 01	21 08	3 58	4 11	4 26	4 43
45	18 51	20 41	3 56	4 14	4 34	4 58
40	18 43	20 22	3 54	4 17	4 42	5 10
35	18 36	20 06	3 53	4 19	4 48	5 20
30	18 30	19 54	3 51	4 21	4 53	5 29
20	18 20	19 36	3 49	4 25	5 03	5 45
10	18 11	19 23	3 47	4 28	5 12	5 59
0	18 02	19 12	3 45	4 31	5 20	6 12
10	17 54	19 05	3 43	4 34	5 28	6 25
20	17 46	19 00	3 41	4 37	5 36	6 39
30	17 36	18 56	3 38	4 41	5 46	6 55
35	17 31	18 56	3 37	4 43	5 52	7 04
40	17 24	18 54	3 35	4 45	5 58	7 15
45	17 17	18 55	3 33	4 48	6 06	7 28
50	17 09	18 57	3 31	4 51	6 15	7 43
52	17 05	18 58	3 30	4 53	6 19	7 51
54	17 00	18 58	3 29	4 54	6 24	7 59
56	16 56	19 00	3 27	4 56	6 29	8 08
58	16 50	19 02	3 26	4 58	6 35	8 19
60	16 44	19 04	3 24	5 01	6 42	8 31
S						

GCT	Equation of Time (App.—Mean) 19	20	21
h	m s	m s	m s
0	+ 0 37.0	+ 0 50.5	+ 1 03.5
6	+ 0 40.4	+ 0 53.8	+ 1 06.7
12	+ 0 43.8	+ 0 57.0	+ 1 09.9
18	+ 0 47.1	+ 1 00.3	+ 1 13.0
24	+ 0 50.5	+ 1 03.5	+ 1 16.1

GCT of Transit Meridian of Greenwich

DAY	Moon	Venus	Mars	Jupiter	Saturn
	h m	h m	h m	h m	h m
19	22 20	14 24	12 31	10 13	22 04
20	23 08	14 25	12 30	10 10	21 59
21	23 59	14 26	12 29	10 07	21 55
22	24 55	14 27	12 27	10 04	21 51

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb	Venus	Mars
°	′	′	′
0			
	0.3	0.1	0.1
30			
	0.3	0.1	0.0
45			
	0.3	0.1	0.0
60			
	0.3	0.0	0.0
75			
	0.3	0.0	0.0
90			

Moon's Lower Limb
Add

Alt.	19	20	21
°	′	′	′
0			
	17.2	18.2	19.1
4			
	17.2	18.2	19.1
8			
	17.2	18.2	19.1
12			
	17.2	18.2	19.0
16			
	17.1	18.1	19.0
20			
	17.1	18.1	18.9
24			
	17.1	18.0	18.8
28			
	17.0	17.9	18.7
32			
	17.0	17.9	18.6
36			
	16.9	17.8	18.5
40			
	16.9	17.7	18.4
44			
	16.8	17.6	18.3
48			
	16.7	17.5	18.1
52			
	16.7	17.4	18.0
56			
	16.6	17.2	17.8
60			
	16.5	17.1	17.6
64			
	16.4	17.0	17.5
68			
	16.4	16.8	17.3
72			
	16.3	16.7	17.1
76			
	16.2	16.6	16.9
80			
	16.1	16.4	16.7
84			
	16.0	16.3	16.5
88			
	15.9	16.2	16.4
90			

Add to table, back cover

Moon's Upper Limb
Subtract

Alt.	19	20	21
°	′	′	′
0			
	14.6	14.0	13.5
4			
	14.6	14.0	13.5
8			
	14.6	14.1	13.6
12			
	14.6	14.1	13.6
16			
	14.7	14.1	13.6
20			
	14.7	14.2	13.7
24			
	14.7	14.2	13.8
28			
	14.8	14.3	13.9
32			
	14.8	14.4	14.0
36			
	14.9	14.5	14.1
40			
	14.9	14.6	14.2
44			
	15.0	14.7	14.4
48			
	15.1	14.8	14.5
52			
	15.1	14.9	14.7
56			
	15.2	15.0	14.8
60			
	15.3	15.1	15.0
64			
	15.4	15.3	15.2
68			
	15.5	15.4	15.4
72			
	15.5	15.5	15.5
76			
	15.6	15.7	15.7
80			
	15.7	15.8	15.9
84			
	15.8	16.0	16.1
88			
	15.9	16.1	16.3
90			

Subtract from table, back cover

First Day of Passover 21
Full Moon 21

GCT	♈	VENUS −3.5		MARS 1.5		JUPITER −1.6		SATURN 1.0		MOON			
	GHA	GHA	Dec.	GHA	Dec.	GHA	Dec.	GHA	Dec.	GHA	code	Dec.	code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
0	209 14.7	143 26.0	+23 08.2	173 00.6	+14 16.2	208 44.3	− 0 57.2	31 18.3	+ 3 37.9	0 14.0	87	−15 42.4	−148
1	224 17.1	158 25.3	08.8	188 01.2	16.8	223 46.3	57.0	46 20.9	38.0	14 41.7	87	15 57.2	−148
2	239 19.6	173 24.6	09.4	203 01.9	17.4	238 48.2	56.8	61 23.5	38.0	29 09.4	85	16 12.0	−148
3	254 22.1	188 24.0	·· 10.0	218 02.6	·· 18.0	253 50.1	·· 56.6	76 26.1	·· 38.1	43 36.9	85	·16 26.8	−146
4	269 24.5	203 23.3	10.6	233 03.3	18.6	268 52.1	56.3	91 28.7	38.1	58 04.4	83	16 41.4	−145
5	284 27.0	218 22.6	11.2	248 03.9	19.3	283 54.0	56.1	106 31.3	38.2	72 31.7	82	16 55.9	−144
6	299 29.4	233 22.0	+23 11.8	263 04.6	+14 19.9	298 56.0	− 0 55.9	121 33.8	+ 3 38.2	86 58.9	81	−17 10.3	−144
7	314 31.9	248 21.3	12.4	278 05.3	20.5	313 57.9	55.7	136 36.4	38.3	101 26.0	80	17 24.7	−142
8	329 34.4	263 20.6	13.0	293 06.0	21.1	328 59.9	55.5	151 39.0	38.4	115 53.0	78	17 38.9	−142
9	344 36.8	278 19.9	·· 13.5	308 06.6	·· 21.7	344 01.8	·· 55.2	166 41.6	·· 38.4	130 19.8	78	·17 53.1	−140
10	359 39.3	293 19.3	14.1	323 07.3	22.3	359 03.8	55.0	181 44.2	38.5	144 46.6	76	18 07.1	−140
11	14 41.8	308 18.6	14.7	338 08.0	22.9	14 05.7	54.8	196 46.8	38.5	159 13.2	76	18 21.1	−138
12	29 44.2	323 17.9	+23 15.3	353 08.7	+14 23.5	29 07.7	− 0 54.6	211 49.4	+ 3 38.6	173 39.8	74	−18 34.9	−138
13	44 46.7	338 17.2	15.9	8 09.4	24.2	44 09.6	54.4	226 52.0	38.6	188 06.2	73	18 48.7	−136
14	59 49.2	353 16.6	16.5	23 10.0	24.8	59 11.6	54.1	241 54.6	38.7	202 32.5	71	19 02.3	−135
15	74 51.6	8 15.9	·· 17.0	38 10.7	·· 25.4	74 13.5	·· 53.9	256 57.2	·· 38.7	216 58.6	71	·19 15.8	−134
16	89 54.1	23 15.2	17.6	53 11.4	26.0	89 15.5	53.7	271 59.8	38.8	231 24.7	70	19 29.2	−133
17	104 56.6	38 14.5	18.2	68 12.1	26.6	104 17.4	53.5	287 02.4	38.8	245 50.7	68	19 42.5	−131
18	119 59.0	53 13.8	+23 18.8	83 12.7	+14 27.2	119 19.4	− 0 53.3	302 05.0	+ 3 38.9	260 16.5	67	−19 55.6	−131
19	135 01.5	68 13.2	19.3	98 13.4	27.8	134 21.3	53.1	317 07.6	38.9	274 42.2	66	20 08.7	−129
20	150 03.9	83 12.5	19.9	113 14.1	28.4	149 23.3	52.8	332 10.2	39.0	289 07.8	65	20 21.6	−128
21	165 06.4	98 11.8	·· 20.5	128 14.8	·· 29.0	164 25.2	·· 52.6	347 12.8	·· 39.0	303 33.3	64	·20 34.4	−127
22	180 08.9	113 11.1	21.1	143 15.4	29.7	179 27.2	52.4	2 15.4	39.1	317 58.7	62	20 47.1	−125
23	195 11.3	128 10.5	21.6	158 16.1	30.3	194 29.1	52.2	17 18.0	39.1	332 23.9	62	20 59.6	−124
0	210 13.8	143 09.8	+23 22.2	173 16.8	+14 30.9	209 31.1	− 0 52.0	32 20.6	+ 3 39.2	346 49.1	60	−21 12.0	−123
1	225 16.3	158 09.1	22.8	188 17.5	31.5	224 33.0	51.8	47 23.2	39.2	1 14.1	59	21 24.3	−121
2	240 18.7	173 08.4	23.3	203 18.1	32.1	239 35.0	51.5	62 25.8	39.3	15 39.0	58	21 36.4	−120
3	255 21.2	188 07.7	·· 23.9	218 18.8	·· 32.7	254 36.9	·· 51.3	77 28.4	·· 39.3	30 03.8	57	·21 48.4	−119
4	270 23.7	203 07.1	24.5	233 19.5	33.3	269 38.9	51.1	92 31.0	39.4	44 28.5	56	22 00.3	−117
5	285 26.1	218 06.4	25.0	248 20.2	33.9	284 40.8	50.9	107 33.6	39.4	58 53.1	54	22 12.0	−116
6	300 28.6	233 05.7	+23 25.6	263 20.8	+14 34.5	299 42.8	− 0 50.7	122 36.2	+ 3 39.5	73 17.5	54	−22 23.6	−114
7	315 31.0	248 05.0	26.2	278 21.5	35.1	314 44.7	50.4	137 38.8	39.5	87 41.9	52	22 35.0	−113
8	330 33.5	263 04.3	26.7	293 22.2	35.7	329 46.7	50.2	152 41.3	39.6	102 06.1	51	22 46.3	−111
9	345 36.0	278 03.6	·· 27.3	308 22.9	·· 36.4	344 48.6	·· 50.0	167 43.9	·· 39.6	116 30.2	50	·22 57.4	−110
10	0 38.4	293 03.0	27.8	323 23.6	37.0	359 50.6	49.8	182 46.5	39.7	130 54.2	49	23 08.4	−108
11	15 40.9	308 02.3	28.4	338 24.2	37.6	14 52.5	49.6	197 49.1	39.7	145 18.1	48	23 19.2	−106
12	30 43.4	323 01.6	+23 29.0	353 24.9	+14 38.2	29 54.5	− 0 49.4	212 51.7	+ 3 39.8	159 41.9	47	−23 29.8	−105
13	45 45.8	338 00.9	29.5	8 25.6	38.8	44 56.4	49.1	227 54.3	39.8	174 05.6	46	23 40.3	−104
14	60 48.3	353 00.2	30.1	23 26.3	39.4	59 58.4	48.9	242 56.9	39.9	188 29.2	44	23 50.7	−102
15	75 50.8	7 59.6	·· 30.6	38 26.9	·· 40.0	75 00.3	·· 48.7	257 59.5	·· 39.9	202 52.6	44	·24 00.9	−100
16	90 53.2	22 58.9	31.2	53 27.6	40.6	90 02.3	48.5	273 02.1	40.0	217 16.0	43	24 10.9	− 98
17	105 55.7	37 58.2	31.7	68 28.3	41.2	105 04.2	48.3	288 04.7	40.0	231 39.3	41	24 20.7	− 97
18	120 58.2	52 57.5	+23 32.3	83 28.9	+14 41.8	120 06.2	− 0 48.1	303 07.3	+ 3 40.1	246 02.4	41	−24 30.4	− 95
19	136 00.6	67 56.8	32.8	98 29.6	42.4	135 08.1	47.8	318 09.9	40.1	260 25.5	39	24 39.9	− 94
20	151 03.1	82 56.1	33.4	113 30.3	43.0	150 10.1	47.6	333 12.5	40.2	274 48.4	39	24 49.3	− 91
21	166 05.5	97 55.5	·· 33.9	128 31.0	·· 43.6	165 12.0	·· 47.4	348 15.1	·· 40.2	289 11.3	38	·24 58.4	− 90
22	181 08.0	112 54.8	34.5	143 31.6	44.2	180 14.0	47.2	3 17.7	40.3	303 34.1	36	25 07.4	− 88
23	196 10.5	127 54.1	35.0	158 32.3	44.8	195 15.9	47.0	18 20.3	40.3	317 56.7	36	25 16.2	− 87
0	211 12.9	142 53.4	+23 35.6	173 33.0	+14 45.4	210 17.9	− 0 46.8	33 22.9	+ 3 40.4	332 19.3	35	−25 24.9	− 84
1	226 15.4	157 52.7	36.1	188 33.7	46.0	225 19.8	46.5	48 25.4	40.4	346 41.8	34	25 33.3	− 83
2	241 17.9	172 52.0	36.6	203 34.3	46.6	240 21.8	46.3	63 28.0	40.5	1 04.2	33	25 41.6	− 81
3	256 20.3	187 51.3	·· 37.2	218 35.0	·· 47.2	255 23.8	·· 46.1	78 30.6	·· 40.5	15 26.5	32	·25 49.7	− 79
4	271 22.8	202 50.7	37.7	233 35.7	47.8	270 25.7	45.9	93 33.2	40.6	29 48.7	32	25 57.6	− 77
5	286 25.3	217 50.0	38.3	248 36.4	48.4	285 27.7	45.7	108 35.8	40.6	44 10.9	30	26 05.3	− 75
6	301 27.7	232 49.3	+23 38.8	263 37.0	+14 49.0	300 29.6	− 0 45.5	123 38.4	+ 3 40.7	58 32.9	30	−26 12.8	− 73
7	316 30.2	247 48.6	39.3	278 37.7	49.6	315 31.6	45.2	138 41.0	40.7	72 54.9	29	26 20.1	− 72
8	331 32.7	262 47.9	39.9	293 38.4	50.2	330 33.5	45.0	153 43.6	40.8	87 16.8	28	26 27.3	− 69
9	346 35.1	277 47.2	·· 40.4	308 39.1	·· 50.8	345 35.5	·· 44.8	168 46.2	·· 40.8	101 38.6	28	·26 34.2	− 68
10	1 37.6	292 46.5	40.9	323 39.7	51.4	0 37.4	44.6	183 48.8	40.9	116 00.4	27	26 41.0	− 66
11	16 40.0	307 45.9	41.5	338 40.4	52.0	15 39.4	44.4	198 51.4	40.9	130 22.1	26	26 47.6	− 63
12	31 42.5	322 45.2	+23 42.0	353 41.1	+14 52.6	30 41.3	− 0 44.2	213 54.0	+ 3 41.0	144 43.7	25	−26 53.9	− 62
13	46 45.0	337 44.5	42.5	8 41.7	53.2	45 43.3	43.9	228 56.5	41.0	159 05.2	25	27 00.1	− 60
14	61 47.4	352 43.8	43.1	23 42.4	53.8	60 45.2	43.7	243 59.1	41.1	173 26.7	24	27 06.1	− 57
15	76 49.9	7 43.1	·· 43.6	38 43.1	·· 54.4	75 47.2	·· 43.5	259 01.7	·· 41.1	187 48.1	24	·27 11.8	− 56
16	91 52.4	22 42.4	44.1	53 43.8	55.0	90 49.1	43.3	274 04.3	41.2	202 09.5	23	27 17.4	− 53
17	106 54.8	37 41.7	44.6	68 44.4	55.6	105 51.1	43.1	289 06.9	41.2	216 30.8	23	27 22.7	− 52
18	121 57.3	52 41.0	+23 45.2	83 45.1	+14 56.2	120 53.0	− 0 42.9	304 09.5	+ 3 41.3	230 52.1	22	−27 27.9	− 50
19	136 59.8	67 40.3	45.7	98 45.8	56.8	135 55.0	42.6	319 12.1	41.3	245 13.3	22	27 32.9	− 47
20	152 02.2	82 39.7	46.2	113 46.5	57.4	150 57.0	42.4	334 14.7	41.4	259 34.5	21	27 37.6	− 46
21	167 04.7	97 39.0	·· 46.7	128 47.1	·· 58.0	165 58.9	·· 42.2	349 17.3	·· 41.4	273 55.6	21	·27 42.2	− 43
22	182 07.2	112 38.3	47.2	143 47.8	58.6	181 00.9	42.0	4 19.9	41.5	288 16.7	20	27 46.5	− 41
23	197 09.6	127 37.6	47.8	158 48.5	59.2	196 02.8	41.8	19 22.5	41.5	302 37.7	20	27 50.6	− 39
24	212 12.1	142 36.9	+23 48.3	173 49.1	+14 59.8	211 04.8	− 0 41.6	34 25.0	+ 3 41.6	316 58.7	20	−27 54.5	− 38
code	—	− 7	+ 5	+ 7	+ 6	+ 19	+ 3	+ 26	0				

SUN

GCT h	GHA ° ′	Dec. ° ′
0	180 19.1	+11 50.9
1	195 19.2	51.8
2	210 19.4	52.6
3	225 19.5	•• 53.5
4	240 19.6	54.3
5	255 19.7	55.2
6	270 19.9	+11 56.0
7	285 20.0	56.8
8	300 20.1	57.7
9	315 20.3	•• 58.5
10	330 20.4	11 59.4
11	345 20.5	12 00.2
12	0 20.6	+12 01.1
13	15 20.8	01.9
14	30 20.9	02.8
15	45 21.0	•• 03.6
16	60 21.1	04.4
17	75 21.3	05.3
18	90 21.4	+12 06.1
19	105 21.5	07.0
20	120 21.6	07.8
21	135 21.8	•• 08.7
22	150 21.9	09.5
23	165 22.0	10.3
0	180 22.1	+12 11.2
1	195 22.3	12.0
2	210 22.4	12.9
3	225 22.5	•• 13.7
4	240 22.6	14.5
5	255 22.8	15.4
6	270 22.9	+12 16.2
7	285 23.0	17.1
8	300 23.1	17.9
9	315 23.3	•• 18.7
10	330 23.4	19.6
11	345 23.5	20.4
12	0 23.6	+12 21.3
13	15 23.7	22.1
14	30 23.9	22.9
15	45 24.0	•• 23.8
16	60 24.1	24.6
17	75 24.2	25.4
18	90 24.4	+12 26.3
19	105 24.5	27.1
20	120 24.6	27.9
21	135 24.7	•• 28.8
22	150 24.8	29.6
23	165 25.0	30.4
0	180 25.1	+12 31.3
1	195 25.2	32.1
2	210 25.3	32.9
3	225 25.4	•• 33.8
4	240 25.6	34.6
5	255 25.7	35.4
6	270 25.8	+12 36.3
7	285 25.9	37.1
8	300 26.0	37.9
9	315 26.1	•• 38.7
10	330 26.3	39.6
11	345 26.4	40.4
12	0 26.5	+12 41.2
13	15 26.6	42.1
14	30 26.7	42.9
15	45 26.9	•• 43.7
16	60 27.0	44.5
17	75 27.1	45.4
18	90 27.2	+12 46.2
19	105 27.3	47.0
20	120 27.4	47.8
21	135 27.5	•• 48.7
22	150 27.7	49.5
23	165 27.8	50.3
24	180 27.9	+12 51.1
code	—	+ 8

STARS

No.	SHA ° ′	Dec. ° ′	Transit Mer. Gr. h m
1	358 32.4	+28 49.1	10 03
2	358 22.2	+58 52.7	10 04
3	349 43.0	−18 15.2	10 38
4	339 21.7	+59 58.9	11 20
5	336 01.8	−57 28.9	11 33
6	333 01.3	+89 02.2	11 45
7	328 54.0	+23 14.0	12 02
8	315 54.1	−40 29.9	12 53
9	309 48.0	+49 41.5	13 18
10	291 43.4	+16 24.9	14 30
11	281 57.2	− 8 15.4	15 09
12	281 44.0	+45 57.3	15 10
13	279 22.4	+ 6 18.5	15 19
14	279 12.0	+28 34.3	15 20
15	276 34.1	− 1 13.9	15 30
16	271 52.1	+ 7 24.1	15 49
17	264 17.2	−52 40.2	16 19
18	259 15.1	−16 38.9	16 39
19	255 49.4	−28 54.4	16 53
20	245 48.7	+ 5 21.1	17 33
21	244 24.9	+28 08.9	17 39
22	234 37.4	−59 21.3	18 18
23	223 26.9	−43 14.3	19 02
24	221 50.0	−69 31.2	19 09
25	218 42.0	− 8 26.9	19 21
26	208 33.1	+12 12.4	20 02
27	194 48.1	+62 01.0	20 56
28	183 21.0	+14 50.6	21 42
29	174 01.5	−62 50.0	22 19
30	172 52.9	−56 50.7	22 24
31	168 46.7	−59 25.6	22 40
32	167 00.8	+56 13.4	22 47
33	159 29.7	+55 10.7	23 17
34	159 20.3	−10 54.7	23 18
35	153 35.0	+49 33.2	23 41
36	149 02.5	−36 08.1	0 03
37	146 38.0	+19 25.9	0 13
38	140 55.4	−60 38.4	0 35
39	137 16.1	+74 21.1	0 50
40	126 50.2	+26 52.4	1 31
41	120 37.9	−22 29.3	1 56
42	113 23.4	−26 19.7	2 25
43	109 07.0	−68 56.5	2 42
44	103 06.0	−15 40.2	3 06
45	97 25.2	−37 04.3	3 29
46	96 49.6	+12 35.3	3 31
47	91 07.6	+51 29.2	3 54
48	84 45.6	−34 24.7	4 19
49	81 10.5	+38 43.8	4 34
50	76 56.1	−26 21.7	4 51
51	62 53.8	+ 8 44.0	5 47
52	54 32.7	−56 53.5	6 20
53	50 03.5	+45 05.9	6 38
54	34 33.2	+ 9 38.8	7 40
55	28 42.4	−47 11.8	8 03
56	16 15.6	−29 52.8	8 53
57	14 25.2	+14 56.4	9 00

Sunrise, Twilight, Moonrise

Lat.	Sunrise	Twlt. begins	Moonrise 22	23	24	25
N °	h m	h m	h m	h m	h m	h m
70	3 19	////	■	■	■	■
68	3 37	////	23 52	■	■	■
66	3 52	////	22 51	■	■	■
64	4 04	////	22 17	25 22	1 22	■
62	4 14	////	21 52	24 08	0 08	■
60	4 22	////	21 32	23 33	25 28	1 28
58	4 30	1 18	21 16	23 07	24 50	0 50
56	4 37	1 50	21 03	22 47	24 23	0 23
54	4 43	2 13	20 51	22 30	24 01	0 01
52	4 48	2 31	20 41	22 16	23 44	24 54
50	4 53	2 46	20 32	22 03	23 29	24 38
45	5 03	3 14	20 12	21 38	22 58	24 07
40	5 12	3 33	19 57	21 17	22 35	23 43
35	5 19	3 49	19 44	21 00	22 15	23 23
30	5 26	4 02	19 33	20 46	21 59	23 06
20	5 37	4 21	19 13	20 21	21 31	22 37
10	5 46	4 35	18 57	20 00	21 07	22 13
0	5 55	4 45	18 41	19 41	20 44	21 50
10	6 04	4 53	18 26	19 21	20 22	21 27
20	6 13	4 59	18 10	19 01	19 59	21 02
30	6 23	5 03	17 51	18 37	19 31	20 34
35	6 29	5 04	17 41	18 23	19 15	20 17
40	6 36	5 04	17 28	18 07	18 56	19 57
45	6 44	5 05	17 14	17 48	18 34	19 33
50	6 53	5 04	16 57	17 25	18 05	19 02
52	6 58	5 03	16 49	17 14	17 51	18 47
54	7 02	5 01	16 40	17 01	17 35	18 29
56	7 08	5 01	16 30	16 47	17 16	18 07
58	7 13	4 59	16 18	16 30	16 53	17 40
60	7 20	4 58	16 05	16 09	16 22	17 01
S						

Sunset, Twilight, Moonset

Lat.	Sunset	Twlt. ends	Moonset 22	23	24	25
N °	h m	h m	h m	h m	h m	h m
70	20 42	////	2 27	■	■	■
68	20 23	////	2 55	1 37	■	■
66	20 08	////	3 17	2 41	■	■
64	19 55	////	3 34	3 16	2 18	■
62	19 45	////	3 49	3 42	3 32	■
60	19 36	////	4 01	4 02	4 08	4 28
58	19 28	22 48	4 11	4 19	4 34	5 06
56	19 22	22 13	4 21	4 34	4 55	5 34
54	19 16	21 49	4 29	4 46	5 12	5 55
52	19 10	21 30	4 37	4 57	5 27	6 13
50	19 05	21 15	4 43	5 07	5 40	6 28
45	18 55	20 47	4 58	5 28	6 07	6 59
40	18 46	20 26	5 10	5 45	6 28	7 23
35	18 38	20 09	5 20	5 59	6 46	7 43
30	18 32	19 57	5 29	6 11	7 01	8 00
20	18 21	19 38	5 45	6 33	7 27	8 28
10	18 11	19 23	5 59	6 51	7 50	8 53
0	18 02	19 12	6 12	7 09	8 11	9 15
10	17 53	19 04	6 25	7 26	8 32	9 38
20	17 44	18 58	6 39	7 45	8 54	10 03
30	17 33	18 53	6 55	8 07	9 21	10 31
35	17 27	18 52	7 04	8 20	9 36	10 48
40	17 20	18 51	7 15	8 35	9 54	11 08
45	17 12	18 50	7 28	8 53	10 16	11 32
50	17 03	18 51	7 43	9 15	10 44	12 03
52	16 59	18 52	7 51	9 25	10 58	12 18
54	16 54	18 53	7 59	9 38	11 14	12 36
56	16 48	18 53	8 08	9 51	11 32	12 57
58	16 43	18 55	8 19	10 08	11 56	13 25
60	16 36	18 56	8 31	10 27	12 26	14 04
S						

Equation of Time (App.—Mean)

GCT h	22 m s	23 m s	24 m s
0	+ 1 16.1	+ 1 28.3	+ 1 40.1
6	+ 1 19.2	+ 1 31.3	+ 1 42.9
12	+ 1 22.3	+ 1 34.3	+ 1 45.8
18	+ 1 25.3	+ 1 37.2	+ 1 48.6
24	+ 1 28.3	+ 1 40.1	+ 1 51.4

GCT of Transit Meridian of Greenwich

DAY	Moon h m	Venus h m	Mars h m	Jupiter h m	Saturn h m
22	24 55	14 27	12 27	10 04	21 51
23	0 55	14 28	12 26	10 01	21 47
24	1 56	14 29	12 25	9 58	21 43
25	3 00	14 30	12 24	9 54	21 39

ADDITIONAL ALTITUDE CORRECTIONS

Alt. °	Sun's Low'r Limb ′	Venus ′	Mars ′
0			
	0.2	0.1	0.1
30			
	0.2	0.1	0.0
45			
	0.2	0.1	0.0
60			
	0.2	0.0	0.0
75			
	0.2	0.0	0.0
90			

Moon's Lower Limb
Add

Alt. °	22 ′	23 ′	24 ′
0			
	19.6	20.0	20.0
4			
	19.6	20.0	20.0
8			
	19.6	20.0	20.0
12			
	19.5	19.9	19.9
16			
	19.5	19.8	19.8
20			
	19.4	19.8	19.8
24			
	19.3	19.6	19.6
28			
	19.2	19.5	19.5
32			
	19.1	19.4	19.4
36			
	18.9	19.3	19.3
40			
	18.8	19.1	19.1
44			
	18.6	18.9	18.9
48			
	18.5	18.8	18.8
52			
	18.3	18.6	18.6
56			
	18.1	18.4	18.4
60			
	17.9	18.1	18.1
64			
	17.7	17.9	17.9
68			
	17.5	17.7	17.7
72			
	17.3	17.5	17.5
76			
	17.1	17.2	17.2
80			
	16.9	17.0	17.0
84			
	16.6	16.7	16.7
88			
	16.5	16.6	16.6
90			

Add to table, back cover

Moon's Upper Limb
Subtract

Alt. °	22 ′	23 ′	24 ′
0			
	13.2	13.0	13.0
4			
	13.2	13.0	13.0
8			
	13.3	13.1	13.1
12			
	13.3	13.1	13.1
16			
	13.4	13.2	13.2
20			
	13.5	13.3	13.3
24			
	13.5	13.4	13.4
28			
	13.6	13.5	13.5
32			
	13.8	13.6	13.6
36			
	13.9	13.7	13.7
40			
	14.0	13.9	13.9
44			
	14.2	14.1	14.1
48			
	14.4	14.3	14.3
52			
	14.5	14.4	14.4
56			
	14.7	14.6	14.6
60			
	14.9	14.9	14.9
64			
	15.1	15.1	15.1
68			
	15.3	15.3	15.3
72			
	15.5	15.5	15.5
76			
	15.8	15.8	15.8
80			
	16.0	16.0	16.0
84			
	16.2	16.3	16.3
88			
	16.4	16.4	16.4
90			

Subtract from table, back cover

GCT	♈ GHA	VENUS −3.5 GHA	VENUS Dec.	MARS 1.6 GHA	MARS Dec.	JUPITER −1.6 GHA	JUPITER Dec.	SATURN 1.0 GHA	SATURN Dec.	MOON GHA	code	MOON Dec.	code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
0	212 12.1	142 36.9	+23 48.3	173 49.1	+14 59.8	211 04.8	− 0 41.6	34 25.0	+ 3 41.6	316 58.7	20	−27 54.5	− 38
1	227 14.5	157 36.2	48.8	188 49.8	15 00.4	226 06.7	41.3	49 27.6	41.6	331 19.7	19	27 58.3	− 35
2	242 17.0	172 35.5	49.3	203 50.5	01.0	241 08.7	41.1	64 30.2	41.7	345 40.6	19	28 01.8	− 33
3	257 19.5	187 34.8	·· 49.8	218 51.2	·· 01.6	256 10.6	·· 40.9	79 32.8	·· 41.7	0 01.5	19	·28 05.1	− 30
4	272 21.9	202 34.1	50.3	233 51.8	02.2	271 12.6	40.7	94 35.4	41.8	14 22.4	19	28 08.1	− 29
5	287 24.4	217 33.4	50.8	248 52.5	02.8	286 14.5	40.5	109 38.0	41.8	28 43.3	19	28 11.0	− 27
6	302 26.9	232 32.7	+23 51.4	263 53.2	+15 03.4	301 16.5	− 0 40.3	124 40.6	+ 3 41.9	43 04.2	18	−28 13.7	− 24
7	317 29.3	247 32.0	51.9	278 53.8	04.0	316 18.4	40.1	139 43.2	41.9	57 25.0	19	28 16.1	− 23
8	332 31.8	262 31.4	52.4	293 54.5	04.6	331 20.4	39.8	154 45.8	42.0	71 45.9	18	28 18.4	− 20
9	347 34.3	277 30.7	·· 52.9	308 55.2	·· 05.2	346 22.4	·· 39.6	169 48.3	·· 42.0	86 06.7	18	·28 20.4	− 18
10	2 36.7	292 30.0	53.4	323 55.9	05.8	1 24.3	39.4	184 50.9	42.1	100 27.5	18	28 22.2	− 16
11	17 39.2	307 29.3	53.9	338 56.5	06.4	16 26.3	39.2	199 53.5	42.1	114 48.3	19	28 23.8	− 14
12	32 41.7	322 28.6	+23 54.4	353 57.2	+15 07.0	31 28.2	− 0 39.0	214 56.1	+ 3 42.1	129 09.2	18	−28 25.2	− 12
13	47 44.1	337 27.9	54.9	8 57.9	07.6	46 30.2	38.8	229 58.7	42.2	143 30.0	18	28 26.4	− 9
14	62 46.6	352 27.2	55.4	23 58.5	08.2	61 32.1	38.5	245 01.3	42.2	157 50.8	19	28 27.3	− 8
15	77 49.0	7 26.5	·· 55.9	38 59.2	·· 08.8	76 34.1	·· 38.3	260 03.9	·· 42.3	172 11.7	19	·28 28.1	− 5
16	92 51.5	22 25.8	56.4	53 59.9	09.3	91 36.0	38.1	275 06.5	42.3	186 32.6	18	28 28.6	− 4
17	107 54.0	37 25.1	56.9	69 00.6	09.9	106 38.0	37.9	290 09.1	42.4	200 53.4	20	28 29.0	− 1
18	122 56.4	52 24.4	+23 57.4	84 01.2	+15 10.5	121 39.9	− 0 37.7	305 11.6	+ 3 42.4	215 14.4	19	−28 29.1	+ 1
19	137 58.9	67 23.7	57.9	99 01.9	11.1	136 41.9	37.5	320 14.2	42.5	229 35.3	19	28 29.0	+ 3
20	153 01.4	82 23.0	58.4	114 02.6	11.7	151 43.9	37.3	335 16.8	42.5	243 56.2	20	28 28.7	+ 5
21	168 03.8	97 22.3	·· 58.9	129 03.2	·· 12.3	166 45.8	·· 37.0	350 19.4	·· 42.6	258 17.2	21	·28 28.2	+ 7
22	183 06.3	112 21.6	59.4	144 03.9	12.9	181 47.8	36.8	5 22.0	42.6	272 38.3	20	28 27.5	+ 9
23	198 08.8	127 20.9	23 59.9	159 04.6	13.5	196 49.7	36.6	20 24.6	42.7	286 59.3	21	28 26.6	+ 12
0	213 11.2	142 20.2	+24 00.4	174 05.3	+15 14.1	211 51.7	− 0 36.4	35 27.2	+ 3 42.7	301 20.4	22	−28 25.4	+ 13
1	228 13.7	157 19.6	00.9	189 05.9	14.7	226 53.6	36.2	50 29.8	42.8	315 41.6	22	28 24.1	+ 16
2	243 16.1	172 18.9	01.3	204 06.6	15.3	241 55.6	36.0	65 32.3	42.8	330 02.8	22	28 22.5	+ 17
3	258 18.6	187 18.2	·· 01.8	219 07.3	·· 15.8	256 57.6	·· 35.8	80 34.9	·· 42.9	344 24.0	23	·28 20.8	+ 20
4	273 21.1	202 17.5	02.3	234 07.9	16.4	271 59.5	35.5	95 37.5	42.9	358 45.3	23	28 18.8	+ 21
5	288 23.5	217 16.8	02.8	249 08.6	17.0	287 01.5	35.3	110 40.1	42.9	13 06.6	24	28 16.7	+ 24
6	303 26.0	232 16.1	+24 03.3	264 09.3	+15 17.6	302 03.4	− 0 35.1	125 42.7	+ 3 43.0	27 28.0	25	−28 14.3	+ 26
7	318 28.5	247 15.4	03.8	279 09.9	18.2	317 05.4	34.9	140 45.3	43.0	41 49.5	25	28 11.7	+ 28
8	333 30.9	262 14.7	04.3	294 10.6	18.8	332 07.3	34.7	155 47.9	43.1	56 11.0	26	28 08.9	+ 29
9	348 33.4	277 14.0	·· 04.7	309 11.3	·· 19.4	347 09.3	·· 34.5	170 50.4	·· 43.1	70 32.6	27	·28 06.0	+ 32
10	3 35.9	292 13.3	05.2	324 11.9	20.0	2 11.2	34.3	185 53.0	43.2	84 54.3	27	28 02.8	+ 34
11	18 38.3	307 12.6	05.7	339 12.6	20.6	17 13.2	34.0	200 55.6	43.2	99 16.0	28	27 59.4	+ 35
12	33 40.8	322 11.9	+24 06.2	354 13.3	+15 21.1	32 15.2	− 0 33.8	215 58.2	+ 3 43.3	113 37.8	29	−27 55.9	+ 38
13	48 43.3	337 11.2	06.6	9 14.0	21.7	47 17.1	33.6	231 00.8	43.3	127 59.7	30	27 52.1	+ 40
14	63 45.7	352 10.5	07.1	24 14.6	22.3	62 19.1	33.4	246 03.4	43.4	142 21.7	30	27 48.1	+ 41
15	78 48.2	7 09.8	·· 07.6	39 15.3	·· 22.9	77 21.0	·· 33.2	261 06.0	·· 43.4	156 43.7	32	·27 44.0	+ 44
16	93 50.6	22 09.1	08.1	54 16.0	23.5	92 23.0	33.0	276 08.5	43.5	171 05.9	32	27 39.6	+ 45
17	108 53.1	37 08.4	08.5	69 16.6	24.1	107 24.9	32.8	291 11.1	43.5	185 28.1	33	27 35.1	+ 47
18	123 55.6	52 07.7	+24 09.0	84 17.3	+15 24.7	122 26.9	− 0 32.5	306 13.7	+ 3 43.6	199 50.4	34	−27 30.4	+ 49
19	138 58.0	67 07.0	09.5	99 18.0	25.2	137 28.9	32.3	321 16.3	43.6	214 12.8	34	27 25.5	+ 51
20	154 00.5	82 06.3	09.9	114 18.6	25.8	152 30.8	32.1	336 18.9	43.6	228 35.2	36	27 20.4	+ 53
21	169 03.0	97 05.6	·· 10.4	129 19.3	·· 26.4	167 32.8	·· 31.9	351 21.5	·· 43.7	242 57.8	37	·27 15.1	+ 55
22	184 05.4	112 04.9	10.9	144 20.0	27.0	182 34.7	31.7	6 24.0	43.7	257 20.5	38	27 09.6	+ 56
23	199 07.9	127 04.2	11.3	159 20.6	27.6	197 36.7	31.5	21 26.6	43.8	271 43.3	38	27 04.0	+ 59
0	214 10.4	142 03.5	+24 11.8	174 21.3	+15 28.2	212 38.7	− 0 31.3	36 29.2	+ 3 43.8	286 06.1	40	−26 58.1	+ 60
1	229 12.8	157 02.8	12.3	189 22.0	28.8	227 40.6	31.0	51 31.8	43.9	300 29.1	41	26 52.1	+ 62
2	244 15.3	172 02.1	12.7	204 22.6	29.3	242 42.6	30.8	66 34.4	43.9	314 52.2	41	26 45.9	+ 63
3	259 17.8	187 01.4	·· 13.2	219 23.3	·· 29.9	257 44.5	·· 30.6	81 37.0	·· 44.0	329 15.3	43	·26 39.6	+ 66
4	274 20.2	202 00.7	13.7	234 24.0	30.5	272 46.5	30.4	96 39.6	44.0	343 38.6	44	26 33.0	+ 67
5	289 22.7	217 00.0	14.1	249 24.6	31.1	287 48.4	30.2	111 42.1	44.1	358 02.0	45	26 26.3	+ 69
6	304 25.1	231 59.3	+24 14.6	264 25.3	+15 31.7	302 50.4	− 0 30.0	126 44.7	+ 3 44.1	12 25.5	46	−26 19.4	+ 70
7	319 27.6	246 58.6	15.0	279 26.0	32.3	317 52.4	29.8	141 47.3	44.1	26 49.1	48	26 12.4	+ 72
8	334 30.1	261 57.9	15.5	294 26.6	32.8	332 54.3	29.5	156 49.9	44.2	41 12.9	48	26 05.2	+ 74
9	349 32.5	276 57.2	·· 15.9	309 27.3	·· 33.4	347 56.3	·· 29.3	171 52.5	·· 44.2	55 36.7	50	·25 57.8	+ 76
10	4 35.0	291 56.5	16.4	324 28.0	34.0	2 58.2	29.1	186 55.1	44.3	70 00.7	50	25 50.2	+ 77
11	19 37.5	306 55.8	16.8	339 28.6	34.6	18 00.2	28.9	201 57.6	44.3	84 24.7	52	25 42.5	+ 79
12	34 39.9	321 55.1	+24 17.3	354 29.3	+15 35.2	33 02.2	− 0 28.7	217 00.2	+ 3 44.4	98 48.9	53	−25 34.6	+ 80
13	49 42.4	336 54.4	17.7	9 30.0	35.7	48 04.1	28.5	232 02.8	44.4	113 13.2	54	25 26.6	+ 82
14	64 44.9	351 53.7	18.2	24 30.6	36.3	63 06.1	28.3	247 05.4	44.5	127 37.6	56	25 18.4	+ 83
15	79 47.3	6 52.9	·· 18.6	39 31.3	·· 36.9	78 08.0	·· 28.1	262 08.0	·· 44.5	142 02.2	56	·25 10.1	+ 85
16	94 49.8	21 52.2	19.1	54 32.0	37.5	93 10.0	27.8	277 10.5	44.5	156 26.8	58	25 01.6	+ 87
17	109 52.3	36 51.5	19.5	69 32.6	38.1	108 12.0	27.6	292 13.1	44.6	170 51.6	59	24 52.9	+ 88
18	124 54.7	51 50.8	+24 20.0	84 33.3	+15 38.6	123 13.9	− 0 27.4	307 15.7	+ 3 44.6	185 16.5	60	−24 44.1	+ 89
19	139 57.2	66 50.1	20.4	99 34.0	39.2	138 15.9	27.2	322 18.3	44.7	199 41.5	62	24 35.2	+ 91
20	154 59.6	81 49.4	20.9	114 34.6	39.8	153 17.8	27.0	337 20.9	44.7	214 06.7	62	24 26.1	+ 92
21	170 02.1	96 48.7	·· 21.3	129 35.3	·· 40.4	168 19.8	·· 26.8	352 23.5	·· 44.8	228 31.9	64	·24 16.9	+ 94
22	185 04.6	111 48.0	21.7	144 36.0	41.0	183 21.8	26.6	7 26.0	44.8	242 57.3	65	24 07.5	+ 95
23	200 07.0	126 47.3	22.2	159 36.6	41.5	198 23.7	26.4	22 28.6	44.9	257 22.8	67	23 58.0	+ 97
24	215 09.5	141 46.6	+24 22.6	174 37.3	+15 42.1	213 25.7	− 0 26.1	37 31.2	+ 3 44.9	271 48.5	67	−23 48.3	+ 98
code	—	− 7	+ 4	+ 7	+ 6	+ 19	+ 2	+ 26	0				

GCT	SUN GHA	SUN Dec.
h	° ′	° ′
0	180 27.9	+12 51.1
1	195 28.0	52.0
2	210 28.1	52.8
3	225 28.2 ··	53.6
4	240 28.4	54.4
5	255 28.5	55.2
6	270 28.6	+12 56.1
7	285 28.7	56.9
8	300 28.8	57.7
9	315 28.9 ··	58.5
10	330 29.0	12 59.4
11	345 29.1	13 00.2
12	0 29.3	+13 01.0
13	15 29.4	01.8
14	30 29.5	02.6
15	45 29.6 ··	03.4
16	60 29.7	04.3
17	75 29.8	05.1
18	90 29.9	+13 05.9
19	105 30.0	06.7
20	120 30.2	07.5
21	135 30.3 ··	08.4
22	150 30.4	09.2
23	165 30.5	10.0
0	180 30.6	+13 10.8
1	195 30.7	11.6
2	210 30.8	12.4
3	225 30.9 ··	13.2
4	240 31.0	14.1
5	255 31.1	14.9
6	270 31.2	+13 15.7
7	285 31.4	16.5
8	300 31.5	17.3
9	315 31.6 ··	18.1
10	330 31.7	18.9
11	345 31.8	19.7
12	0 31.9	+13 20.5
13	15 32.0	21.4
14	30 32.1	22.2
15	45 32.2 ··	23.0
16	60 32.3	23.8
17	75 32.4	24.6
18	90 32.5	+13 25.4
19	105 32.6	26.2
20	120 32.7	27.0
21	135 32.8 ··	27.8
22	150 33.0	28.6
23	165 33.1	29.4
0	180 33.2	+13 30.2
1	195 33.3	31.1
2	210 33.4	31.9
3	225 33.5 ··	32.7
4	240 33.6	33.5
5	255 33.7	34.3
6	270 33.8	+13 35.1
7	285 33.9	35.9
8	300 34.0	36.7
9	315 34.1 ··	37.5
10	330 34.2	38.3
11	345 34.3	39.1
12	0 34.4	+13 39.9
13	15 34.5	40.7
14	30 34.6	41.5
15	45 34.7 ··	42.3
16	60 34.8	43.1
17	75 34.9	43.9
18	90 35.0	+13 44.7
19	105 35.1	45.5
20	120 35.2	46.3
21	135 35.3 ··	47.1
22	150 35.4	47.9
23	165 35.5	48.7
24	180 35.6	+13 49.5
code	—	+ 9

No.	STARS SHA	Dec.	Transit Mer. Gr.
	° ′	° ′	h m
1	358 32.4	+28 49.1	9 51
2	358 22.2	+58 52.7	9 52
3	349 43.0	−18 15.2	10 27
4	339 21.6	+59 58.9	11 08
5	336 01.8	−57 28.9	11 21
6	333 01.1	+89 02.1	11 33
7	328 54.0	+23 14.0	11 50
8	315 54.1	−40 29.9	12 42
9	309 48.0	+49 41.5	13 06
10	291 43.4	+16 24.9	14 18
11	281 57.3	− 8 15.4	14 57
12	281 44.0	+45 57.3	14 58
13	279 22.4	+ 6 18.5	15 07
14	279 12.1	+28 34.3	15 08
15	276 34.1	− 1 13.8	15 18
16	271 52.1	+ 7 24.1	15 37
17	264 17.2	−52 40.2	16 07
18	259 15.1	−16 38.9	16 28
19	255 49.5	−28 54.4	16 41
20	245 48.7	+ 5 21.1	17 21
21	244 24.9	+28 08.9	17 27
22	234 37.4	−59 21.4	18 06
23	223 27.0	−43 14.3	18 50
24	221 50.0	−69 31.2	18 57
25	218 42.0	− 8 26.9	19 09
26	208 33.1	+12 12.4	19 50
27	194 48.2	+62 01.0	20 45
28	183 21.0	+14 50.6	21 30
29	174 01.5	−62 50.0	22 08
30	172 52.9	−56 50.7	22 12
31	168 46.7	−59 25.6	22 28
32	167 00.8	+56 13.4	22 35
33	159 29.7	+55 10.7	23 05
34	159 20.3	−10 54.7	23 06
35	153 35.0	+49 33.2	23 29
36	149 02.5	−36 08.1	23 47
37	146 38.0	+19 25.9	0 01
38	140 55.4	−60 38.4	0 23
39	137 16.1	+74 21.1	0 38
40	126 50.2	+26 52.4	1 20
41	120 37.9	−22 29.3	1 44
42	113 23.4	−26 19.7	2 13
43	109 06.9	−68 56.5	2 30
44	103 06.0	−15 40.2	2 54
45	97 25.2	−37 04.3	3 17
46	96 49.6	+12 35.3	3 19
47	91 07.5	+51 29.2	3 42
48	84 45.6	−34 24.7	4 08
49	81 10.4	+38 43.8	4 22
50	76 56.1	−26 21.7	4 39
51	62 53.8	+ 8 44.0	5 35
52	54 32.6	−56 53.5	6 08
53	50 03.5	+45 05.9	6 26
54	34 33.2	+ 9 38.8	7 28
55	28 42.4	−47 11.8	7 51
56	16 15.6	−29 52.8	8 41
57	14 25.2	+14 56.4	8 48

Lat.	Sunrise	Twlt. begins	Moonrise 25	26	27	28
N °	h m	h m	h m	h m	h m	h m
70	3 03	////	■	■	■	■
68	3 24	////	■	■	■	■
66	3 40	////	■	■	■	4 58
64	3 53	////	■	■	■	4 09
62	4 04	////	■	■	3 50	3 38
60	4 14	////	1 28	2 42	3 07	3 15
58	4 22	0 51	0 50	2 02	2 39	2 56
56	4 29	1 35	0 23	1 34	2 16	2 40
54	4 36	2 01	0 01	1 12	1 58	2 26
52	4 42	2 21	24 54	0 54	1 42	2 14
50	4 47	2 37	24 38	0 38	1 29	2 03
45	4 58	3 07	24 07	0 07	1 01	1 41
40	5 08	3 28	23 43	24 39	0 39	1 23
35	5 16	3 45	23 23	24 21	0 21	1 07
30	5 23	3 59	23 06	24 05	0 05	0 54
20	5 34	4 18	22 37	23 38	24 31	0 31
10	5 45	4 33	22 13	23 15	24 12	0 12
0	5 55	4 44	21 50	22 54	23 53	24 48
10	6 04	4 53	21 27	22 32	23 35	24 33
20	6 14	5 00	21 02	22 09	23 15	24 17
30	6 25	5 04	20 34	21 42	22 51	23 59
35	6 32	5 06	20 17	21 26	22 38	23 49
40	6 39	5 07	19 57	21 07	22 22	23 36
45	6 48	5 07	19 33	20 45	22 03	23 22
50	6 58	5 07	19 02	20 16	21 39	23 04
52	7 03	5 07	18 47	20 02	21 28	22 56
54	7 08	5 07	18 29	19 45	21 15	22 47
56	7 14	5 07	18 07	19 25	21 00	22 36
58	7 20	5 05	17 40	19 01	20 42	22 24
60	7 27	5 04	17 01	18 28	20 20	22 10
S						

Lat.	Sunset	Twlt. ends	Moonset 25	26	27	28
N °	h m	h m	h m	h m	h m	h m
70	20 57	////	■	■	■	■
68	20 35	////	■	■	■	■
66	20 18	////	■	■	■	7 31
64	20 05	////	■	■	■	8 18
62	19 53	////	■	■	6 36	8 49
60	19 44	////	4 28	5 31	7 17	9 12
58	19 35	23 18	5 06	6 11	7 46	9 30
56	19 28	22 29	5 34	6 39	8 08	9 45
54	19 21	22 00	5 55	7 01	8 26	9 58
52	19 15	21 39	6 13	7 19	8 41	10 10
50	19 10	21 23	6 28	7 34	8 54	10 20
45	18 58	20 52	6 59	8 05	9 21	10 41
40	18 49	20 30	7 23	8 29	9 42	10 58
35	18 41	20 13	7 43	8 49	10 00	11 12
30	18 34	20 00	8 00	9 05	10 15	11 24
20	18 21	19 38	8 28	9 34	10 40	11 45
10	18 11	19 23	8 53	9 58	11 02	12 03
0	18 01	19 12	9 15	10 21	11 23	12 20
10	17 52	19 03	9 38	10 43	11 43	12 36
20	17 42	18 56	10 03	11 07	12 04	12 54
30	17 30	18 51	10 31	11 35	12 29	13 14
35	17 24	18 49	10 48	11 51	12 44	13 26
40	17 16	18 47	11 08	12 10	13 00	13 39
45	17 08	18 47	11 32	12 34	13 20	13 55
50	16 57	18 46	12 03	13 03	13 45	14 14
52	16 52	18 46	12 18	13 17	13 57	14 23
54	16 47	18 46	12 36	13 34	14 11	14 33
56	16 41	18 47	12 57	13 54	14 26	14 45
58	16 35	18 48	13 25	14 19	14 45	14 58
60	16 27	18 48	14 04	14 52	15 07	15 13
S						

GCT	Equation of Time (App.—Mean) 25	26	27
h	m s	m s	m s
0	+ 1 51.4	+ 2 02.2	+ 2 12.4
6	+ 1 54.1	+ 2 04.8	+ 2 14.9
12	+ 1 56.8	+ 2 07.4	+ 2 17.4
18	+ 1 59.5	+ 2 09.9	+ 2 19.8
24	+ 2 02.2	+ 2 12.4	+ 2 22.2

GCT of Transit Meridian of Greenwich

DAY	Moon	Venus	Mars	Jupiter	Saturn
	h m	h m	h m	h m	h m
25	3 00	14 30	12 24	9 54	21 39
26	4 05	14 31	12 23	9 51	21 35
27	5 08	14 32	12 22	9 48	21 30
28	6 07	14 34	12 21	9 45	21 26

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb	Venus	Mars
°	′	′	′
0			
	0.2	0.1	0.1
30			
	0.2	0.1	0.0
45			
	0.2	0.1	0.0
60			
	0.2	0.0	0.0
75			
	0.2	0.0	0.0
90			

Moon's Lower Limb
Add

Alt.	25	26	27
°	′	′	′
0			
	19.6	19.1	18.5
4			
	19.6	19.1	18.5
8			
	19.6	19.1	18.4
12			
	19.5	19.0	18.4
16			
	19.5	19.0	18.4
20			
	19.4	18.9	18.3
24			
	19.3	18.8	18.2
28			
	19.2	18.7	18.2
32			
	19.1	18.6	18.1
36			
	18.9	18.5	18.0
40			
	18.8	18.4	17.9
44			
	18.6	18.3	17.8
48			
	18.5	18.1	17.7
52			
	18.3	18.0	17.5
56			
	18.1	17.8	17.4
60			
	17.9	17.6	17.3
64			
	17.7	17.5	17.1
68			
	17.5	17.3	17.0
72			
	17.3	17.1	16.8
76			
	17.1	16.9	16.7
80			
	16.9	16.7	16.5
84			
	16.6	16.5	16.3
88			
	16.5	16.4	16.2
90			

Add to table, back cover

Moon's Upper Limb
Subtract

Alt.	25	26	27
°	′	′	′
0			
	13.2	13.5	13.9
4			
	13.2	13.5	13.9
8			
	13.3	13.6	13.9
12			
	13.3	13.6	13.9
16			
	13.4	13.6	14.0
20			
	13.5	13.7	14.0
24			
	13.5	13.8	14.1
28			
	13.6	13.9	14.2
32			
	13.8	14.0	14.3
36			
	13.9	14.1	14.4
40			
	14.0	14.2	14.5
44			
	14.2	14.4	14.6
48			
	14.4	14.5	14.7
52			
	14.5	14.7	14.8
56			
	14.7	14.8	15.0
60			
	14.9	15.0	15.1
64			
	15.1	15.2	15.2
68			
	15.3	15.4	15.4
72			
	15.5	15.5	15.5
76			
	15.8	15.7	15.7
80			
	16.0	15.9	15.9
84			
	16.2	16.1	16.0
88			
	16.4	16.3	16.1
90			

Subtract from table, back cover

GCT	♈ GHA	VENUS −3.5 GHA	VENUS Dec.	MARS 1.6 GHA	MARS Dec.	JUPITER −1.6 GHA	JUPITER Dec.	SATURN 1.0 GHA	SATURN Dec.	MOON GHA	code	MOON Dec.	code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
0	215 09.5	141 46.6	+24 22.6	174 37.3	+15 42.1	213 25.7	− 0 26.1	37 31.2	+ 3 44.9	271 48.5	67	−23 48.3	+ 98
1	230 12.0	156 45.9	23.0	189 38.0	42.7	228 27.6	25.9	52 33.8	44.9	286 14.2	69	23 38.5	+ 99
2	245 14.4	171 45.2	23.5	204 38.6	43.3	243 29.6	25.7	67 36.4	45.0	300 40.1	70	23 28.6	+101
3	260 16.9	186 44.5	·· 23.9	219 39.3	·· 43.8	258 31.6	·· 25.5	82 38.9	·· 45.0	315 06.1	72	·23 18.5	+102
4	275 19.4	201 43.8	24.3	234 40.0	44.4	273 33.5	25.3	97 41.5	45.1	329 32.3	72	23 08.3	+103
5	290 21.8	216 43.1	24.8	249 40.6	45.0	288 35.5	25.1	112 44.1	45.1	343 58.5	74	22 58.0	+104
6	305 24.3	231 42.4	+24 25.2	264 41.3	+15 45.6	303 37.4	− 0 24.9	127 46.7	+ 3 45.2	358 24.9	75	−22 47.6	+106
7	320 26.7	246 41.7	25.6	279 42.0	46.1	318 39.4	24.7	142 49.3	45.2	12 51.4	77	22 37.0	+107
8	335 29.2	261 41.0	26.1	294 42.6	46.7	333 41.4	24.4	157 51.8	45.3	27 18.1	77	22 26.3	+108
9	350 31.7	276 40.3	·· 26.5	309 43.3	·· 47.3	348 43.3	·· 24.2	172 54.4	·· 45.3	41 44.8	79	·22 15.5	+110
10	5 34.1	291 39.5	26.9	324 44.0	47.9	3 45.3	24.0	187 57.0	45.3	56 11.7	80	22 04.5	+110
11	20 36.6	306 38.8	27.3	339 44.6	48.4	18 47.2	23.8	202 59.6	45.4	70 38.7	82	21 53.5	+112
12	35 39.1	321 38.1	+24 27.8	354 45.3	+15 49.0	33 49.2	− 0 23.6	218 02.2	+ 3 45.4	85 05.9	82	−21 42.3	+113
13	50 41.5	336 37.4	28.2	9 46.0	49.6	48 51.2	23.4	233 04.7	45.5	99 33.1	84	21 31.0	+114
14	65 44.0	351 36.7	28.6	24 46.6	50.2	63 53.1	23.2	248 07.3	45.5	114 00.5	85	21 19.6	+115
15	80 46.5	6 36.0	·· 29.0	39 47.3	·· 50.7	78 55.1	·· 23.0	263 09.9	·· 45.6	128 28.0	86	·21 08.1	+116
16	95 48.9	21 35.3	29.5	54 48.0	51.3	93 57.1	22.7	278 12.5	45.6	142 55.6	88	20 56.5	+117
17	110 51.4	36 34.6	29.9	69 48.6	51.9	108 59.0	22.5	293 15.1	45.6	157 23.4	88	20 44.8	+119
18	125 53.9	51 33.9	+24 30.3	84 49.3	+15 52.5	124 01.0	− 0 22.3	308 17.6	+ 3 45.7	171 51.2	90	−20 32.9	+119
19	140 56.3	66 33.2	30.7	99 49.9	53.0	139 02.9	22.1	323 20.2	45.7	186 19.2	91	20 21.0	+120
20	155 58.8	81 32.5	31.1	114 50.6	53.6	154 04.9	21.9	338 22.8	45.8	200 47.3	92	20 09.0	+122
21	171 01.2	96 31.8	·· 31.5	129 51.3	·· 54.2	169 06.9	·· 21.7	353 25.4	·· 45.8	215 15.5	94	·19 56.8	+122
22	186 03.7	111 31.1	31.9	144 51.9	54.8	184 08.8	21.5	8 27.9	45.9	229 43.9	94	19 44.6	+124
23	201 06.2	126 30.3	32.4	159 52.6	55.3	199 10.8	21.3	23 30.5	45.9	244 12.3	96	19 32.2	+124
0	216 08.6	141 29.6	+24 32.8	174 53.3	+15 55.9	214 12.8	− 0 21.0	38 33.1	+ 3 45.9	258 40.9	97	−19 19.8	+125
1	231 11.1	156 28.9	33.2	189 53.9	56.5	229 14.7	20.8	53 35.7	46.0	273 09.6	98	19 07.3	+126
2	246 13.6	171 28.2	33.6	204 54.6	57.0	244 16.7	20.6	68 38.3	46.0	287 38.4	99	18 54.7	+127
3	261 16.0	186 27.5	·· 34.0	219 55.3	·· 57.6	259 18.6	·· 20.4	83 40.8	·· 46.1	302 07.3	101	·18 42.0	+128
4	276 18.5	201 26.8	34.4	234 55.9	58.2	274 20.6	20.2	98 43.4	46.1	316 36.4	101	18 29.2	+129
5	291 21.0	216 26.1	34.8	249 56.6	58.7	289 22.6	20.0	113 46.0	46.2	331 05.5	103	18 16.3	+129
6	306 23.4	231 25.4	+24 35.2	264 57.2	+15 59.3	304 24.5	− 0 19.8	128 48.6	+ 3 46.2	345 34.8	104	−18 03.4	+131
7	321 25.9	246 24.7	35.6	279 57.9	15 59.9	319 26.5	19.6	143 51.1	46.2	0 04.2	104	17 50.3	+131
8	336 28.4	261 24.0	36.0	294 58.6	16 00.5	334 28.5	19.4	158 53.7	46.3	14 33.6	106	17 37.2	+132
9	351 30.8	276 23.2	·· 36.4	309 59.2	·· 01.0	349 30.4	·· 19.1	173 56.3	·· 46.3	29 03.2	107	·17 24.0	+133
10	6 33.3	291 22.5	36.8	324 59.9	01.6	4 32.4	18.9	188 58.9	46.4	43 32.9	108	17 10.7	+133
11	21 35.7	306 21.8	37.2	340 00.6	02.2	19 34.3	18.7	204 01.5	46.4	58 02.7	109	16 57.4	+134
12	36 38.2	321 21.1	+24 37.6	355 01.2	+16 02.7	34 36.3	− 0 18.5	219 04.0	+ 3 46.4	72 32.6	111	−16 44.0	+135
13	51 40.7	336 20.4	38.0	10 01.9	03.3	49 38.3	18.3	234 06.6	46.5	87 02.7	111	16 30.5	+136
14	66 43.1	351 19.7	38.4	25 02.6	03.9	64 40.2	18.1	249 09.2	46.5	101 32.8	112	16 16.9	+137
15	81 45.6	6 19.0	·· 38.8	40 03.2	·· 04.4	79 42.2	·· 17.9	264 11.8	·· 46.6	116 03.0	113	·16 03.2	+137
16	96 48.1	21 18.3	39.2	55 03.9	05.0	94 44.2	17.7	279 14.3	46.6	130 33.3	115	15 49.5	+137
17	111 50.5	36 17.6	39.6	70 04.5	05.6	109 46.1	17.5	294 16.9	46.7	145 03.8	115	15 35.8	+139
18	126 53.0	51 16.8	+24 39.9	85 05.2	+16 06.1	124 48.1	− 0 17.2	309 19.5	+ 3 46.7	159 34.3	116	−15 21.9	+139
19	141 55.5	66 16.1	40.3	100 05.9	06.7	139 50.1	17.0	324 22.1	46.7	174 04.9	117	15 08.0	+140
20	156 57.9	81 15.4	40.7	115 06.5	07.3	154 52.0	16.8	339 24.6	46.8	188 35.6	118	14 54.0	+140
21	172 00.4	96 14.7	·· 41.1	130 07.2	·· 07.8	169 54.0	·· 16.6	354 27.2	·· 46.8	203 06.4	119	·14 40.0	+141
22	187 02.9	111 14.0	41.5	145 07.8	08.4	184 55.9	16.4	9 29.8	46.9	217 37.3	120	14 25.9	+141
23	202 05.3	126 13.3	41.9	160 08.5	09.0	199 57.9	16.2	24 32.4	46.9	232 08.3	121	14 11.8	+142
0	217 07.8	141 12.6	+24 42.3	175 09.2	+16 09.5	214 59.9	− 0 16.0	39 34.9	+ 3 46.9	246 39.4	122	−13 57.6	+143
1	232 10.2	156 11.9	42.6	190 09.8	10.1	230 01.8	15.8	54 37.5	47.0	261 10.6	123	13 43.3	+143
2	247 12.7	171 11.2	43.0	205 10.5	10.6	245 03.8	15.6	69 40.1	47.0	275 41.9	124	13 29.0	+143
3	262 15.2	186 10.4	·· 43.4	220 11.2	·· 11.2	260 05.8	·· 15.4	84 42.7	·· 47.1	290 13.3	124	·13 14.7	+145
4	277 17.6	201 09.7	43.8	235 11.8	11.8	275 07.7	15.1	99 45.2	47.1	304 44.7	126	13 00.2	+144
5	292 20.1	216 09.0	44.1	250 12.5	12.3	290 09.7	14.9	114 47.8	47.1	319 16.3	126	12 45.8	+145
6	307 22.6	231 08.3	+24 44.5	265 13.1	+16 12.9	305 11.7	− 0 14.7	129 50.4	+ 3 47.2	333 47.9	127	−12 31.3	+146
7	322 25.0	246 07.6	44.9	280 13.8	13.5	320 13.6	14.5	144 53.0	47.2	348 19.6	128	12 16.7	+146
8	337 27.5	261 06.9	45.3	295 14.5	14.0	335 15.6	14.3	159 55.5	47.3	2 51.4	128	12 02.1	+146
9	352 30.0	276 06.2	·· 45.6	310 15.1	·· 14.6	350 17.6	·· 14.1	174 58.1	·· 47.3	17 23.2	130	·11 47.5	+147
10	7 32.4	291 05.4	46.0	325 15.8	15.2	5 19.5	13.9	190 00.7	47.3	31 55.2	130	11 32.8	+147
11	22 34.9	306 04.7	46.4	340 16.4	15.7	20 21.5	13.7	205 03.3	47.4	46 27.2	131	11 18.1	+148
12	37 37.3	321 04.0	+24 46.8	355 17.1	+16 16.3	35 23.5	− 0 13.5	220 05.8	+ 3 47.4	60 59.3	132	−11 03.3	+148
13	52 39.8	336 03.3	47.1	10 17.8	16.8	50 25.4	13.3	235 08.4	47.5	75 31.5	133	10 48.5	+148
14	67 42.3	351 02.6	47.5	25 18.4	17.4	65 27.4	13.0	250 11.0	47.5	90 03.8	133	10 33.7	+149
15	82 44.7	6 01.9	·· 47.9	40 19.1	·· 18.0	80 29.4	·· 12.8	265 13.5	·· 47.5	104 36.1	134	·10 18.8	+149
16	97 47.2	21 01.2	48.2	55 19.7	18.5	95 31.3	12.6	280 16.1	47.6	119 08.5	135	10 03.9	+150
17	112 49.7	36 00.4	48.6	70 20.4	19.1	110 33.3	12.4	295 18.7	47.6	133 41.0	135	9 48.9	+149
18	127 52.1	50 59.7	+24 48.9	85 21.1	+16 19.6	125 35.3	− 0 12.2	310 21.3	+ 3 47.7	148 13.5	136	− 9 34.0	+150
19	142 54.6	65 59.0	49.3	100 21.7	20.2	140 37.2	12.0	325 23.8	47.7	162 46.1	137	9 19.0	+151
20	157 57.1	80 58.3	49.7	115 22.4	20.8	155 39.2	11.8	340 26.4	47.7	177 18.8	137	9 03.9	+150
21	172 59.5	95 57.6	·· 50.0	130 23.0	·· 21.3	170 41.2	·· 11.6	355 29.0	·· 47.8	191 51.5	138	· 8 48.9	+151
22	188 02.0	110 56.9	50.4	145 23.7	21.9	185 43.1	11.4	10 31.5	47.8	206 24.3	139	8 33.8	+151
23	203 04.5	125 56.2	50.7	160 24.4	22.4	200 45.1	11.2	25 34.1	47.9	220 57.2	139	8 18.7	+152
24	218 06.9	140 55.4	+24 51.1	175 25.0	+16 23.0	215 47.1	− 0 10.9	40 36.7	+ 3 47.9	235 30.1	140	− 8 03.5	+151
code	—	− 7	+ 4	+ 7	+ 6	+ 20	+ 2	+ 26	+ 1				

GCT	SUN GHA	Dec.
h	° ′	° ′
0	180 35.6	+13 49.5
1	195 35.7	50.3
2	210 35.8	51.1
3	225 35.9 ••	51.9
4	240 36.0	52.7
5	255 36.1	53.5
6	270 36.2	+13 54.2
7	285 36.3	55.0
8	300 36.4	55.8
9	315 36.5 ••	56.6
10	330 36.6	57.4
11	345 36.7	58.2
12	0 36.8	+13 59.0
13	15 36.9	13 59.8
14	30 37.0	14 00.6
15	45 37.1 ••	01.4
16	60 37.2	02.2
17	75 37.3	03.0
18	90 37.3	+14 03.7
19	105 37.4	04.5
20	120 37.5	05.3
21	135 37.6 ••	06.1
22	150 37.7	06.9
23	165 37.8	07.7
0	180 37.9	+14 08.5
1	195 38.0	09.3
2	210 38.1	10.1
3	225 38.2 ••	10.8
4	240 38.3	11.6
5	255 38.4	12.4
6	270 38.5	+14 13.2
7	285 38.6	14.0
8	300 38.7	14.8
9	315 38.7 ••	15.5
10	330 38.8	16.3
11	345 38.9	17.1
12	0 39.0	+14 17.9
13	15 39.1	18.7
14	30 39.2	19.5
15	45 39.3 ••	20.2
16	60 39.4	21.0
17	75 39.5	21.8
18	90 39.6	+14 22.6
19	105 39.6	23.4
20	120 39.7	24.1
21	135 39.8 ••	24.9
22	150 39.9	25.7
23	165 40.0	26.5
0	180 40.1	+14 27.3
1	195 40.2	28.0
2	210 40.3	28.8
3	225 40.4 ••	29.6
4	240 40.4	30.4
5	255 40.5	31.1
6	270 40.6	+14 31.9
7	285 40.7	32.7
8	300 40.8	33.5
9	315 40.9 ••	34.2
10	330 41.0	35.0
11	345 41.0	35.8
12	0 41.1	+14 36.5
13	15 41.2	37.3
14	30 41.3	38.1
15	45 41.4 ••	38.9
16	60 41.5	39.6
17	75 41.6	40.4
18	90 41.6	+14 41.2
19	105 41.7	41.9
20	120 41.8	42.7
21	135 41.9 ••	43.5
22	150 42.0	44.2
23	165 42.1	45.0
24	180 42.1	+14 45.8
code	—	+ 8

STARS No.	SHA	Dec.	Transit Mer. Gr.
	° ′	° ′	h m
1	358 32.3	+28 49.1	9 40
2	358 22.2	+58 52.7	9 40
3	349 43.0	−18 15.2	10 15
4	339 21.6	+59 58.9	10 56
5	336 01.8	−57 28.9	11 09
6	333 00.8	+89 02.1	11 22
7	328 54.0	+23 14.0	11 38
8	315 54.1	−40 29.9	12 30
9	309 48.0	+49 41.5	12 54
10	291 43.4	+16 24.9	14 06
11	281 57.3	− 8 15.4	14 45
12	281 44.0	+45 57.3	14 46
13	279 22.4	+ 6 18.5	14 55
14	279 12.1	+28 34.3	14 56
15	276 34.1	− 1 13.8	15 07
16	271 52.1	+ 7 24.1	15 25
17	264 17.3	−52 40.2	15 56
18	259 15.1	−16 38.9	16 16
19	255 49.5	−28 54.4	16 29
20	245 48.7	+ 5 21.1	17 09
21	244 24.9	+28 08.9	17 15
22	234 37.4	−59 21.4	17 54
23	223 27.0	−43 14.3	18 39
24	221 50.0	−69 31.2	18 45
25	218 42.0	− 8 26.9	18 58
26	208 33.1	+12 12.4	19 38
27	194 48.2	+62 01.1	20 33
28	183 21.0	+14 50.6	21 19
29	174 01.5	−62 50.0	21 56
30	172 52.9	−56 50.7	22 00
31	168 46.7	−59 25.6	22 17
32	167 00.8	+56 13.4	22 24
33	159 29.7	+55 10.7	22 54
34	159 20.3	−10 54.7	22 54
35	153 35.0	+49 33.3	23 17
36	149 02.5	−36 08.1	23 35
37	146 38.0	+19 25.9	23 45
38	140 55.4	−60 38.4	0 12
39	137 16.1	+74 21.1	0 26
40	126 50.2	+26 52.4	1 08
41	120 37.9	−22 29.3	1 33
42	113 23.4	−26 19.7	2 02
43	109 06.9	−68 56.5	2 19
44	103 05.9	−15 40.2	2 43
45	97 25.2	−37 04.3	3 05
46	96 49.6	+12 35.3	3 08
47	91 07.5	+51 29.2	3 30
48	84 45.6	−34 24.7	3 56
49	81 10.4	+38 43.8	4 10
50	76 56.0	−26 21.7	4 27
51	62 53.8	+ 8 44.0	5 23
52	54 32.6	−56 53.5	5 56
53	50 03.5	+45 05.9	6 14
54	34 33.1	+ 9 38.8	7 16
55	28 42.3	−47 11.8	7 39
56	16 15.6	−29 52.8	8 29
57	14 25.2	+14 56.4	8 36

Lat.	Sunrise	Twlt. begins	Moonrise 28	29	30	1
N °	h m	h m	h m	h m	h m	h m
70	2 47	////	■	5 19	4 20	3 46
68	3 10	////	■	4 39	4 02	3 38
66	3 28	////	4 58	4 10	3 48	3 31
64	3 43	////	4 09	3 49	3 36	3 25
62	3 55	////	3 38	3 31	3 25	3 20
60	4 06	////	3 15	3 17	3 17	3 16
58	4 15	////	2 56	3 04	3 09	3 12
56	4 22	1 16	2 40	2 53	3 02	3 08
54	4 29	1 48	2 26	2 44	2 56	3 05
52	4 36	2 10	2 14	2 35	2 50	3 02
50	4 41	2 27	2 03	2 27	2 45	2 59
45	4 54	3 00	1 41	2 11	2 34	2 53
40	5 04	3 23	1 23	1 57	2 25	2 49
35	5 12	3 40	1 07	1 45	2 17	2 44
30	5 20	3 55	0 54	1 35	2 10	2 41
20	5 33	4 16	0 31	1 18	1 58	2 34
10	5 44	4 31	0 12	1 02	1 47	2 28
0	5 54	4 43	24 48	0 48	1 37	2 23
10	6 04	4 53	24 33	0 33	1 27	2 17
20	6 15	5 00	24 17	0 17	1 16	2 12
30	6 27	5 06	23 59	25 04	1 04	2 05
35	6 34	5 08	23 49	24 56	0 56	2 01
40	6 42	5 10	23 36	24 48	0 48	1 57
45	6 51	5 11	23 22	24 39	0 39	1 51
50	7 03	5 12	23 04	24 27	0 27	1 45
52	7 08	5 12	22 56	24 21	0 21	1 42
54	7 13	5 12	22 47	24 15	0 15	1 39
56	7 20	5 12	22 36	24 08	0 08	1 36
58	7 27	5 11	22 24	24 01	0 01	1 32
60	7 35	5 10	22 10	23 52	25 28	1 28
S						

Lat.	Sunset	Twlt. ends	Moonset 28	29	30	1
N °	h m	h m	h m	h m	h m	h m
70	21 12	////	■	9 03	11 43	13 51
68	20 48	////	■	9 42	11 59	13 57
66	20 29	////	7 31	10 09	12 11	14 01
64	20 14	////	8 18	10 29	12 22	14 05
62	20 02	////	8 49	10 45	12 31	14 08
60	19 51	////	9 12	10 59	12 38	14 11
58	19 42	////	9 30	11 10	12 45	14 14
56	19 34	22 48	9 45	11 20	12 51	14 16
54	19 27	22 13	9 58	11 29	12 56	14 18
52	19 20	21 49	10 10	11 37	13 00	14 20
50	19 14	21 31	10 20	11 44	13 05	14 22
45	19 02	20 58	10 41	11 59	13 14	14 25
40	18 52	20 35	10 58	12 11	13 21	14 28
35	18 43	20 16	11 12	12 22	13 28	14 31
30	18 36	20 02	11 24	12 31	13 33	14 33
20	18 23	19 41	11 45	12 46	13 43	14 37
10	18 11	19 24	12 03	12 59	13 51	14 41
0	18 01	19 12	12 20	13 12	13 59	14 44
10	17 50	19 02	12 36	13 24	14 07	14 47
20	17 40	18 55	12 54	13 37	14 15	14 50
30	17 27	18 48	13 14	13 52	14 24	14 54
35	17 20	18 46	13 26	14 00	14 30	14 56
40	17 12	18 44	13 39	14 10	14 36	14 58
45	17 03	18 42	13 55	14 21	14 43	15 01
50	16 52	18 41	14 14	14 35	14 51	15 04
52	16 46	18 40	14 23	14 41	14 54	15 06
54	16 41	18 41	14 33	14 48	14 59	15 07
56	16 34	18 41	14 45	14 56	15 03	15 09
58	16 27	18 41	14 58	15 04	15 08	15 11
60	16 19	18 41	15 13	15 14	15 14	15 13
S						

GCT	Equation of Time (App.—Mean) 28	29	30
h	m s	m s	m s
0	+ 2 22.2	+ 2 31.5	+ 2 40.2
6	+ 2 24.6	+ 2 33.7	+ 2 42.3
12	+ 2 26.9	+ 2 35.9	+ 2 44.4
18	+ 2 29.2	+ 2 38.1	+ 2 46.4
24	+ 2 31.5	+ 2 40.2	+ 2 48.4

GCT of Transit Meridian of Greenwich

DAY	Moon	Venus	Mars	Jupiter	Saturn
	h m	h m	h m	h m	h m
28	6 07	14 34	12 21	9 45	21 26
29	7 00	14 35	12 20	9 42	21 22
30	7 48	14 36	12 19	9 39	21 18
1	8 33	14 37	12 18	9 36	21 14

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb	Venus	Mars
°	′	′	′
0–30	0.2	0.1	0.1
30–45	0.2	0.1	0.0
45–60	0.2	0.1	0.0
60–75	0.2	0.0	0.0
75–90	0.2	0.0	0.0

Moon's Lower Limb
Add

Alt.	28	29	30
°	′	′	′
0–4	17.7	16.8	16.1
4–8	17.7	16.8	16.1
8–12	17.7	16.8	16.1
12–16	17.7	16.8	16.0
16–20	17.6	16.8	16.0
20–24	17.6	16.8	16.0
24–28	17.5	16.7	16.0
28–32	17.5	16.7	16.0
32–36	17.4	16.7	16.0
36–40	17.4	16.6	16.0
40–44	17.3	16.6	16.0
44–48	17.2	16.5	15.9
48–52	17.1	16.5	15.9
52–56	17.0	16.4	15.9
56–60	16.9	16.4	15.9
60–64	16.8	16.3	15.8
64–68	16.7	16.2	15.8
68–72	16.6	16.2	15.8
72–76	16.5	16.1	15.8
76–80	16.4	16.0	15.7
80–84	16.3	16.0	15.7
84–88	16.1	15.9	15.7
88–90	16.0	15.8	15.7

Add to table, back cover

Moon's Upper Limb
Subtract

Alt.	28	29	30
°	′	′	′
0–4	14.3	14.8	15.3
4–8	14.3	14.8	15.3
8–12	14.3	14.8	15.3
12–16	14.4	14.9	15.3
16–20	14.4	14.9	15.3
20–24	14.4	14.9	15.3
24–28	14.5	14.9	15.3
28–32	14.5	15.0	15.3
32–36	14.6	15.0	15.3
36–40	14.7	15.0	15.3
40–44	14.8	15.1	15.4
44–48	14.8	15.1	15.4
48–52	14.9	15.2	15.4
52–56	15.0	15.2	15.4
56–60	15.1	15.3	15.4
60–64	15.2	15.4	15.5
64–68	15.3	15.4	15.5
68–72	15.4	15.5	15.5
72–76	15.5	15.5	15.5
76–80	15.7	15.6	15.6
80–84	15.8	15.7	15.6
84–88	15.9	15.8	15.6
88–90	16.0	15.8	15.7

Subtract from table, back cover

Last Quarter 28
Rogation Sunday 29

G C T	♈ GHA	VENUS −3.5 GHA	Dec.	MARS 1.6 GHA	Dec.	JUPITER −1.7 GHA	Dec.	SATURN 1.0 GHA	Dec.	MOON GHA	code	Dec.	code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
0	218 06.9	140 55.4	+24 51.1	175 25.0	+16 23.0	215 47.1	− 0 10.9	40 36.7	+ 3 47.9	235 30.1	140	− 8 03.5	+151
1	233 09.4	155 54.7	51.4	190 25.7	23.5	230 49.0	10.7	55 39.3	47.9	250 03.1	141	7 48.4	+152
2	248 11.8	170 54.0	51.8	205 26.3	24.1	245 51.0	10.5	70 41.8	48.0	264 36.2	141	7 33.2	+152
3	263 14.3	185 53.3	·· 52.1	220 27.0	·· 24.7	260 53.0	·· 10.3	85 44.4	·· 48.0	279 09.3	141	· 7 18.0	+152
4	278 16.8	200 52.6	52.5	235 27.7	25.2	275 54.9	10.1	100 47.0	48.1	293 42.4	142	7 02.8	+153
5	293 19.2	215 51.9	52.8	250 28.3	25.8	290 56.9	09.9	115 49.5	48.1	308 15.6	143	6 47.5	+152
6	308 21.7	230 51.2	+24 53.2	265 29.0	+16 26.3	305 58.9	− 0 09.7	130 52.1	+ 3 48.1	322 48.9	143	− 6 32.3	+153
7	323 24.2	245 50.4	53.5	280 29.6	26.9	321 00.8	09.5	145 54.7	48.2	337 22.2	144	6 17.0	+153
8	338 26.6	260 49.7	53.9	295 30.3	27.4	336 02.8	09.3	160 57.3	48.2	351 55.6	144	6 01.7	+153
9	353 29.1	275 49.0	·· 54.2	310 31.0	·· 28.0	351 04.8	·· 09.1	175 59.8	·· 48.3	6 29.0	145	· 5 46.4	+153
10	8 31.6	290 48.3	54.6	325 31.6	28.5	6 06.7	08.9	191 02.4	48.3	21 02.5	145	5 31.1	+153
11	23 34.0	305 47.6	54.9	340 32.3	29.1	21 08.7	08.6	206 05.0	48.3	35 36.0	145	5 15.8	+154
12	38 36.5	320 46.9	+24 55.3	355 32.9	+16 29.7	36 10.7	− 0 08.4	221 07.5	+ 3 48.4	50 09.5	147	− 5 00.4	+153
13	53 38.9	335 46.1	55.6	10 33.6	30.2	51 12.6	08.2	236 10.1	48.4	64 43.2	146	4 45.1	+154
14	68 41.4	350 45.4	55.9	25 34.2	30.8	66 14.6	08.0	251 12.7	48.5	79 16.8	147	4 29.7	+153
15	83 43.9	5 44.7	·· 56.3	40 34.9	·· 31.3	81 16.6	·· 07.8	266 15.2	·· 48.5	93 50.5	147	· 4 14.4	+154
16	98 46.3	20 44.0	56.6	55 35.6	31.9	96 18.5	07.6	281 17.8	48.5	108 24.2	148	3 59.0	+154
17	113 48.8	35 43.3	56.9	70 36.2	32.4	111 20.5	07.4	296 20.4	48.6	122 58.0	148	3 43.6	+153
18	128 51.3	50 42.6	+24 57.3	85 36.9	+16 33.0	126 22.5	− 0 07.2	311 23.0	+ 3 48.6	137 31.8	148	− 3 28.3	+154
19	143 53.7	65 41.8	57.6	100 37.5	33.5	141 24.5	07.0	326 25.5	48.6	152 05.6	149	3 12.9	+154
20	158 56.2	80 41.1	57.9	115 38.2	34.1	156 26.4	06.8	341 28.1	48.7	166 39.5	149	2 57.5	+154
21	173 58.7	95 40.4	·· 58.3	130 38.9	·· 34.6	171 28.4	·· 06.6	356 30.7	·· 48.7	181 13.4	150	· 2 42.1	+154
22	189 01.1	110 39.7	58.6	145 39.5	35.2	186 30.4	06.4	11 33.2	48.8	195 47.4	150	2 26.7	+153
23	204 03.6	125 39.0	58.9	160 40.2	35.7	201 32.3	06.1	26 35.8	48.8	210 21.4	150	2 11.4	+154
0	219 06.1	140 38.3	+24 59.2	175 40.8	+16 36.3	216 34.3	− 0 05.9	41 38.4	+ 3 48.8	224 55.4	150	− 1 56.0	+154
1	234 08.5	155 37.5	59.6	190 41.5	36.8	231 36.3	05.7	56 40.9	48.9	239 29.4	151	1 40.6	+154
2	249 11.0	170 36.8	24 59.9	205 42.1	37.4	246 38.2	05.5	71 43.5	48.9	254 03.5	151	1 25.2	+153
3	264 13.4	185 36.1	·25 00.2	220 42.8	·· 37.9	261 40.2	·· 05.3	86 46.1	·· 48.9	268 37.6	151	· 1 09.9	+154
4	279 15.9	200 35.4	00.5	235 43.5	38.5	276 42.2	05.1	101 48.6	49.0	283 11.7	151	0 54.5	+153
5	294 18.4	215 34.7	00.9	250 44.1	39.0	291 44.1	04.9	116 51.2	49.0	297 45.8	152	0 39.2	+154
6	309 20.8	230 34.0	+25 01.2	265 44.8	+16 39.6	306 46.1	− 0 04.7	131 53.8	+ 3 49.1	312 20.0	152	− 0 23.8	+153
7	324 23.3	245 33.2	01.5	280 45.4	40.1	321 48.1	04.5	146 56.3	49.1	326 54.2	152	− 0 08.5	+153
8	339 25.8	260 32.5	01.8	295 46.1	40.7	336 50.1	04.3	161 58.9	49.1	341 28.4	152	+ 0 06.8	+153
9	354 28.2	275 31.8	·· 02.1	310 46.7	·· 41.2	351 52.0	·· 04.1	177 01.5	·· 49.2	356 02.6	152	· 0 22.1	+153
10	9 30.7	290 31.1	02.5	325 47.4	41.8	6 54.0	03.9	192 04.0	49.2	10 36.8	153	0 37.4	+153
11	24 33.2	305 30.4	02.8	340 48.1	42.3	21 56.0	03.7	207 06.6	49.2	25 11.1	153	0 52.7	+153
12	39 35.6	320 29.6	+25 03.1	355 48.7	+16 42.9	36 57.9	− 0 03.4	222 09.2	+ 3 49.3	39 45.4	153	+ 1 08.0	+152
13	54 38.1	335 28.9	03.4	10 49.4	43.4	51 59.9	03.2	237 11.7	49.3	54 19.7	153	1 23.2	+153
14	69 40.6	350 28.2	03.7	25 50.0	44.0	67 01.9	03.0	252 14.3	49.4	68 54.0	153	1 38.5	+152
15	84 43.0	5 27.5	·· 04.0	40 50.7	·· 44.5	82 03.9	·· 02.8	267 16.9	·· 49.4	83 28.3	153	· 1 53.7	+152
16	99 45.5	20 26.8	04.3	55 51.3	45.1	97 05.8	02.6	282 19.4	49.4	98 02.6	154	2 08.9	+152
17	114 47.9	35 26.1	04.6	70 52.0	45.6	112 07.8	02.4	297 22.0	49.5	112 37.0	153	2 24.1	+151
18	129 50.4	50 25.3	+25 04.9	85 52.7	+16 46.1	127 09.8	− 0 02.2	312 24.6	+ 3 49.5	127 11.3	154	+ 2 39.2	+152
19	144 52.9	65 24.6	05.2	100 53.3	46.7	142 11.7	02.0	327 27.1	49.5	141 45.7	153	2 54.4	+151
20	159 55.3	80 23.9	05.5	115 54.0	47.2	157 13.7	01.8	342 29.7	49.6	156 20.0	154	3 09.5	+151
21	174 57.8	95 23.2	·· 05.8	130 54.6	·· 47.8	172 15.7	·· 01.6	357 32.3	·· 49.6	170 54.4	154	· 3 24.6	+151
22	190 00.3	110 22.5	06.1	145 55.3	48.3	187 17.7	01.4	12 34.8	49.7	185 28.8	153	3 39.7	+150
23	205 02.7	125 21.7	06.4	160 55.9	48.9	202 19.6	01.2	27 37.4	49.7	200 03.1	154	3 54.7	+150
0	220 05.2	140 21.0	+25 06.7	175 56.6	+16 49.4	217 21.6	− 0 01.0	42 40.0	+ 3 49.7	214 37.5	154	+ 4 09.7	+150
1	235 07.7	155 20.3	07.0	190 57.2	50.0	232 23.6	00.8	57 42.5	49.8	229 11.9	154	4 24.7	+150
2	250 10.1	170 19.6	07.3	205 57.9	50.5	247 25.5	00.5	72 45.1	49.8	243 46.3	153	4 39.7	+149
3	265 12.6	185 18.9	·· 07.6	220 58.5	·· 51.0	262 27.5	·· 00.3	87 47.7	·· 49.8	258 20.6	154	· 4 54.6	+149
4	280 15.0	200 18.2	07.9	235 59.2	51.6	277 29.5	− 0 00.1	102 50.2	49.9	272 55.0	154	5 09.5	+149
5	295 17.5	215 17.4	08.2	250 59.9	52.1	292 31.5	+ 0 00.1	117 52.8	49.9	287 29.4	153	5 24.4	+149
6	310 20.0	230 16.7	+25 08.5	266 00.5	+16 52.7	307 33.4	+ 0 00.3	132 55.3	+ 3 49.9	302 03.7	154	+ 5 39.3	+148
7	325 22.4	245 16.0	08.8	281 01.2	53.2	322 35.4	00.5	147 57.9	50.0	316 38.1	153	5 54.1	+147
8	340 24.9	260 15.3	09.1	296 01.8	53.8	337 37.4	00.7	163 00.5	50.0	331 12.4	154	6 08.8	+148
9	355 27.4	275 14.6	·· 09.4	311 02.5	·· 54.3	352 39.4	·· 00.9	178 03.0	·· 50.0	345 46.8	153	· 6 23.6	+147
10	10 29.8	290 13.8	09.7	326 03.1	54.8	7 41.3	01.1	193 05.6	50.1	0 21.1	153	6 38.3	+147
11	25 32.3	305 13.1	09.9	341 03.8	55.4	22 43.3	01.3	208 08.2	50.1	14 55.4	153	6 53.0	+146
12	40 34.8	320 12.4	+25 10.2	356 04.4	+16 55.9	37 45.3	+ 0 01.5	223 10.7	+ 3 50.2	29 29.7	153	+ 7 07.6	+146
13	55 37.2	335 11.7	10.5	11 05.1	56.5	52 47.2	01.7	238 13.3	50.2	44 04.0	153	7 22.2	+146
14	70 39.7	350 11.0	10.8	26 05.7	57.0	67 49.2	01.9	253 15.9	50.2	58 38.3	153	7 36.8	+145
15	85 42.2	5 10.2	·· 11.1	41 06.4	·· 57.5	82 51.2	·· 02.1	268 18.4	·· 50.3	73 12.6	153	· 7 51.3	+145
16	100 44.6	20 09.5	11.4	56 07.1	58.1	97 53.2	02.3	283 21.0	50.3	87 46.9	152	8 05.8	+144
17	115 47.1	35 08.8	11.6	71 07.7	58.6	112 55.1	02.6	298 23.5	50.3	102 21.1	152	8 20.2	+144
18	130 49.5	50 08.1	+25 11.9	86 08.4	+16 59.2	127 57.1	+ 0 02.8	313 26.1	+ 3 50.4	116 55.3	152	+ 8 34.6	+143
19	145 52.0	65 07.4	12.2	101 09.0	16 59.7	142 59.1	03.0	328 28.7	50.4	131 29.5	152	8 48.9	+144
20	160 54.5	80 06.7	12.5	116 09.7	17 00.2	158 01.1	03.2	343 31.2	50.4	146 03.7	152	9 03.3	+142
21	175 56.9	95 05.9	·· 12.7	131 10.3	·· 00.8	173 03.0	·· 03.4	358 33.8	·· 50.5	160 37.9	151	· 9 17.5	+142
22	190 59.4	110 05.2	13.0	146 11.0	01.3	188 05.0	03.6	13 36.4	50.5	175 12.0	152	9 31.7	+142
23	206 01.9	125 04.5	13.3	161 11.6	01.8	203 07.0	03.8	28 38.9	50.5	189 46.2	151	9 45.9	+141
24	221 04.3	140 03.8	+25 13.6	176 12.3	+17 02.4	218 09.0	+ 0 04.0	43 41.5	+ 3 50.6	204 20.3	151	+10 00.0	+141
code	—	− 7	+ 3	+ 7	+ 5	+ 20	+ 2	+ 25	0				

GCT	SUN GHA	SUN Dec.
h	° ′	° ′
0	180 42.1	+14 45.8
1	195 42.2	46.6
2	210 42.3	47.3
3	225 42.4	·· 48.1
4	240 42.5	48.9
5	255 42.6	49.6
6	270 42.6	+14 50.4
7	285 42.7	51.1
8	300 42.8	51.9
9	315 42.9	·· 52.7
10	330 42.9	53.4
11	345 43.0	54.2
12	0 43.1	+14 55.0
13	15 43.2	55.7
14	30 43.3	56.5
15	45 43.3	·· 57.2
16	60 43.4	58.0
17	75 43.5	58.8
18	90 43.6	+14 59.5
19	105 43.7	15 00.3
20	120 43.7	01.0
21	135 43.8	·· 01.8
22	150 43.9	02.6
23	165 44.0	03.3
0	180 44.0	+15 04.1
1	195 44.1	04.8
2	210 44.2	05.6
3	225 44.3	·· 06.3
4	240 44.3	07.1
5	255 44.4	07.9
6	270 44.5	+15 08.6
7	285 44.6	09.4
8	300 44.6	10.1
9	315 44.7	·· 10.9
10	330 44.8	11.6
11	345 44.9	12.4
12	0 44.9	+15 13.1
13	15 45.0	13.9
14	30 45.1	14.6
15	45 45.2	·· 15.4
16	60 45.2	16.1
17	75 45.3	16.9
18	90 45.4	+15 17.6
19	105 45.5	18.4
20	120 45.5	19.1
21	135 45.6	·· 19.9
22	150 45.7	20.6
23	165 45.7	21.4
0	180 45.8	+15 22.1
1	195 45.9	22.9
2	210 46.0	23.6
3	225 46.0	·· 24.4
4	240 46.1	25.1
5	255 46.2	25.9
6	270 46.2	+15 26.6
7	285 46.3	27.3
8	300 46.4	28.1
9	315 46.4	·· 28.8
10	330 46.5	29.6
11	345 46.6	30.3
12	0 46.6	+15 31.1
13	15 46.7	31.8
14	30 46.8	32.5
15	45 46.8	·· 33.3
16	60 46.9	34.0
17	75 47.0	34.8
18	90 47.0	+15 35.5
19	105 47.1	36.2
20	120 47.2	37.0
21	135 47.2	·· 37.7
22	150 47.3	38.4
23	165 47.4	39.2
24	180 47.4	+15 39.9
code	−	+ 8

STARS No.	SHA	Dec.	Transit Mer. Gr.
	° ′	° ′	h m
1	358 32.3	+28 49.1	9 28
2	358 22.2	+58 52.7	9 29
3	349 43.0	−18 15.2	10 03
4	339 21.6	+59 58.9	10 44
5	336 01.8	−57 28.9	10 58
6	333 00.5	+89 02.1	11 10
7	328 54.0	+23 14.0	11 26
8	315 54.1	−40 29.9	12 18
9	309 48.0	+49 41.5	12 42
10	291 43.4	+16 24.9	13 54
11	281 57.3	− 8 15.4	14 33
12	281 44.0	+45 57.3	14 34
13	279 22.4	+ 6 18.5	14 44
14	279 12.1	+28 34.3	14 44
15	276 34.1	− 1 13.8	14 55
16	271 52.2	+ 7 24.1	15 14
17	264 17.3	−52 40.2	15 44
18	259 15.1	−16 38.9	16 04
19	255 49.5	−28 54.4	16 18
20	245 48.8	+ 5 21.1	16 58
21	244 24.9	+28 08.9	17 03
22	234 37.5	−59 21.4	17 42
23	223 27.0	−43 14.3	18 27
24	221 50.1	−69 31.2	18 33
25	218 42.0	− 8 26.9	18 46
26	208 33.1	+12 12.4	19 26
27	194 48.2	+62 01.1	20 21
28	183 21.0	+14 50.6	21 07
29	174 01.5	−62 50.0	21 44
30	172 52.9	−56 50.7	21 48
31	168 46.7	−59 25.6	22 05
32	167 00.8	+56 13.5	22 12
33	159 29.7	+55 10.7	22 42
34	159 20.3	−10 54.7	22 43
35	153 35.0	+49 33.3	23 05
36	149 02.5	−36 08.1	23 24
37	146 38.0	+19 25.9	23 33
38	140 55.4	−60 38.4	23 56
39	137 16.1	+74 21.1	0 14
40	126 50.2	+26 52.4	0 56
41	120 37.9	−22 29.3	1 21
42	113 23.4	−26 19.7	1 50
43	109 06.8	−68 56.5	2 07
44	103 05.9	−15 40.2	2 31
45	97 25.1	−37 04.3	2 53
46	96 49.6	+12 35.4	2 56
47	91 07.5	+51 29.3	3 19
48	84 45.6	−34 24.7	3 44
49	81 10.4	+38 43.9	3 58
50	76 56.0	−26 21.6	4 15
51	62 53.7	+ 8 44.0	5 11
52	54 32.6	−56 53.5	5 44
53	50 03.5	+45 05.9	6 02
54	34 33.1	+ 9 38.8	7 04
55	28 42.3	−47 11.8	7 28
56	16 15.6	−29 52.8	8 17
57	14 25.2	+14 56.4	8 25

Lat.	Sunrise	Twlt. begins	Moonrise 1	Moonrise 2	Moonrise 3	Moonrise 4
N °	h m	h m	h m	h m	h m	h m
70	2 29	////	3 46	3 19	2 53	2 25
68	2 56	////	3 38	3 18	2 59	2 38
66	3 16	////	3 31	3 17	3 03	2 49
64	3 33	////	3 25	3 16	3 07	2 58
62	3 46	////	3 20	3 15	3 10	3 06
60	3 57	////	3 16	3 14	3 13	3 12
58	4 07	////	3 12	3 14	3 16	3 18
56	4 16	0 53	3 08	3 13	3 18	3 24
54	4 23	1 33	3 05	3 13	3 20	3 29
52	4 30	1 59	3 02	3 12	3 22	3 33
50	4 36	2 19	2 59	3 12	3 24	3 37
45	4 49	2 54	2 53	3 11	3 28	3 46
40	5 00	3 18	2 49	3 10	3 31	3 53
35	5 09	3 36	2 44	3 10	3 34	3 59
30	5 17	3 51	2 41	3 09	3 36	4 05
20	5 31	4 13	2 34	3 08	3 41	4 14
10	5 43	4 30	2 28	3 07	3 45	4 23
0	5 54	4 43	2 23	3 06	3 48	4 31
10	6 05	4 52	2 17	3 05	3 52	4 39
20	6 16	5 01	2 12	3 05	3 56	4 48
30	6 29	5 07	2 05	3 04	4 01	4 58
35	6 37	5 10	2 01	3 03	4 03	5 04
40	6 45	5 12	1 57	3 02	4 07	5 11
45	6 55	5 14	1 51	3 02	4 10	5 18
50	7 07	5 15	1 45	3 01	4 14	5 28
52	7 12	5 16	1 42	3 00	4 16	5 32
54	7 19	5 16	1 39	3 00	4 19	5 37
56	7 25	5 16	1 36	3 00	4 21	5 43
58	7 33	5 16	1 32	2 59	4 24	5 49
60	7 42	5 16	1 28	2 58	4 27	5 55
S						

Lat.	Sunset	Twlt. ends	Moonset 1	Moonset 2	Moonset 3	Moonset 4
N °	h m	h m	h m	h m	h m	h m
70	21 29	////	13 51	15 49	17 48	19 57
68	21 01	////	13 57	15 47	17 37	19 33
66	20 40	////	14 01	15 45	17 28	19 15
64	20 24	////	14 05	15 43	17 21	19 01
62	20 10	////	14 08	15 42	17 15	18 49
60	19 58	////	14 11	15 41	17 09	18 38
58	19 49	////	14 14	15 39	17 04	18 29
56	19 40	23 13	14 16	15 38	17 00	18 22
54	19 32	22 27	14 18	15 38	16 56	18 15
52	19 25	22 00	14 20	15 37	16 53	18 09
50	19 19	21 40	14 22	15 36	16 50	18 03
45	19 06	21 04	14 25	15 35	16 43	17 51
40	18 55	20 39	14 28	15 33	16 37	17 41
35	18 46	20 20	14 31	15 32	16 33	17 33
30	18 37	20 04	14 33	15 31	16 28	17 25
20	18 24	19 42	14 37	15 29	16 21	17 13
10	18 12	19 25	14 41	15 28	16 15	17 02
0	18 00	19 11	14 44	15 26	16 09	16 52
10	17 50	19 02	14 47	15 25	16 03	16 41
20	17 38	18 53	14 50	15 23	15 57	16 31
30	17 25	18 46	14 54	15 22	15 49	16 18
35	17 17	18 43	14 56	15 21	15 45	16 11
40	17 09	18 41	14 58	15 19	15 41	16 03
45	16 59	18 39	15 01	15 18	15 35	15 54
50	16 47	18 37	15 04	15 17	15 29	15 42
52	16 41	18 36	15 06	15 16	15 26	15 37
54	16 35	18 36	15 07	15 15	15 23	15 31
56	16 28	18 35	15 09	15 14	15 19	15 25
58	16 20	18 35	15 11	15 13	15 15	15 18
60	16 12	18 36	15 13	15 12	15 11	15 10
S						

GCT	Equation of Time (App.—Mean) 1	2	3
h	m s	m s	m s
0	+ 2 48.4	+ 2 56.0	+ 3 03.1
6	+ 2 50.3	+ 2 57.8	+ 3 04.8
12	+ 2 52.3	+ 2 59.6	+ 3 06.4
18	+ 2 54.2	+ 3 01.4	+ 3 08.1
24	+ 2 56.0	+ 3 03.1	+ 3 09.6

GCT of Transit Meridian of Greenwich

DAY	Moon	Venus	Mars	Jupiter	Saturn
	h m	h m	h m	h m	h m
1	8 33	14 37	12 18	9 36	21 14
2	9 16	14 38	12 17	9 33	21 10
3	9 59	14 39	12 16	9 29	21 06
4	10 41	14 41	12 15	9 26	21 02

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb	Venus	Mars
°	′	′	′
0			
	0.2	0.1	0.1
30			
	0.2	0.1	0.0
45			
	0.2	0.1	0.0
60			
	0.2	0.0	0.0
75			
	0.2	0.0	0.0
90			

Moon's Lower Limb
Add

Alt.	1	2	3
°	′	′	′
0	15.3	14.7	14.0
4	15.3	14.7	14.0
8	15.3	14.7	14.0
12	15.3	14.7	14.1
16	15.3	14.7	14.1
20	15.3	14.7	14.1
24	15.3	14.7	14.1
28	15.3	14.8	14.2
32	15.3	14.8	14.2
36	15.3	14.8	14.3
40	15.3	14.8	14.3
44	15.4	14.9	14.4
48	15.4	14.9	14.5
52	15.4	14.9	14.5
56	15.4	15.0	14.6
60	15.4	15.0	14.7
64	15.4	15.1	14.7
68	15.4	15.1	14.8
72	15.4	15.2	14.9
76	15.5	15.2	15.0
80	15.5	15.3	15.1
84	15.5	15.3	15.1
88	15.5	15.3	15.2
90			

Add to table, back cover

Moon's Upper Limb
Subtract

Alt.	1	2	3
°	′	′	′
0	15.7	16.1	16.4
4	15.7	16.1	16.4
8	15.7	16.0	16.4
12	15.7	16.0	16.4
16	15.7	16.0	16.4
20	15.7	16.0	16.3
24	15.7	16.0	16.3
28	15.7	16.0	16.3
32	15.7	15.9	16.2
36	15.7	15.9	16.2
40	15.6	15.9	16.1
44	15.6	15.8	16.1
48	15.6	15.8	16.0
52	15.6	15.8	15.9
56	15.6	15.7	15.9
60	15.6	15.7	15.8
64	15.6	15.6	15.7
68	15.6	15.6	15.6
72	15.6	15.6	15.6
76	15.5	15.5	15.5
80	15.5	15.5	15.4
84	15.5	15.4	15.3
88	15.5	15.4	15.2
90			

Subtract from table, back cover

Ascension Day 3

GCT	♈ GHA	VENUS −3.6 GHA	Dec.	MARS 1.6 GHA	Dec.	JUPITER −1.7 GHA	Dec.	SATURN 1.0 GHA	Dec.	MOON GHA	code	Dec.	code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
0	221 04.3	140 03.8	+25 13.6	176 12.3	+17 02.4	218 09.0	+ 0 04.0	43 41.5	+ 3 50.6	204 20.3	151	+10 00.0	+141
1	236 06.8	155 03.1	13.8	191 12.9	02.9	233 10.9	04.2	58 44.0	50.6	218 54.4	150	10 14.1	+140
2	251 09.3	170 02.3	14.1	206 13.6	03.5	248 12.9	04.4	73 46.6	50.6	233 28.4	150	10 28.1	+140
3	266 11.7	185 01.6	·· 14.4	221 14.2	·· 04.0	263 14.9	·· 04.6	88 49.2	·· 50.7	248 02.4	150	·10 42.1	+139
4	281 14.2	200 00.9	14.6	236 14.9	04.5	278 16.9	04.8	103 51.7	50.7	262 36.4	150	10 56.0	+138
5	296 16.7	215 00.2	14.9	251 15.6	05.1	293 18.8	05.0	118 54.3	50.8	277 10.4	150	11 09.8	+139
6	311 19.1	229 59.5	+25 15.2	266 16.2	+17 05.6	308 20.8	+ 0 05.2	133 56.8	+ 3 50.8	291 44.4	149	+11 23.7	+137
7	326 21.6	244 58.7	15.4	281 16.9	06.1	323 22.8	05.4	148 59.4	50.8	306 18.3	149	11 37.4	+137
8	341 24.0	259 58.0	15.7	296 17.5	06.7	338 24.8	05.6	164 02.0	50.9	320 52.2	148	11 51.1	+137
9	356 26.5	274 57.3	·· 15.9	311 18.2	·· 07.2	353 26.7	·· 05.8	179 04.5	·· 50.9	335 26.0	149	·12 04.8	+135
10	11 29.0	289 56.6	16.2	326 18.8	07.7	8 28.7	06.0	194 07.1	50.9	349 59.9	148	12 18.3	+136
11	26 31.4	304 55.9	16.5	341 19.5	08.3	23 30.7	06.3	209 09.6	51.0	4 33.7	147	12 31.9	+134
12	41 33.9	319 55.1	+25 16.7	356 20.1	+17 08.8	38 32.7	+ 0 06.5	224 12.2	+ 3 51.0	19 07.4	148	+12 45.3	+134
13	56 36.4	334 54.4	17.0	11 20.8	09.3	53 34.6	06.7	239 14.8	51.0	33 41.2	146	12 58.7	+134
14	71 38.8	349 53.7	17.2	26 21.4	09.9	68 36.6	06.9	254 17.3	51.1	48 14.8	147	13 12.1	+133
15	86 41.3	4 53.0	·· 17.5	41 22.1	·· 10.4	83 38.6	·· 07.1	269 19.9	·· 51.1	62 48.5	146	·13 25.4	+132
16	101 43.8	19 52.3	17.7	56 22.7	10.9	98 40.6	07.3	284 22.4	51.1	77 22.1	146	13 38.6	+132
17	116 46.2	34 51.5	18.0	71 23.4	11.5	113 42.5	07.5	299 25.0	51.2	91 55.7	146	13 51.8	+131
18	131 48.7	49 50.8	+25 18.2	86 24.0	+17 12.0	128 44.5	+ 0 07.7	314 27.6	+ 3 51.2	106 29.3	145	+14 04.9	+130
19	146 51.1	64 50.1	18.5	101 24.7	12.5	143 46.5	07.9	329 30.1	51.2	121 02.8	144	14 17.9	+130
20	161 53.6	79 49.4	18.7	116 25.3	13.1	158 48.5	08.1	344 32.7	51.3	135 36.2	145	14 30.9	+129
21	176 56.1	94 48.7	·· 19.0	131 26.0	·· 13.6	173 50.4	·· 08.3	359 35.2	·· 51.3	150 09.7	144	·14 43.8	+128
22	191 58.5	109 47.9	19.2	146 26.6	14.1	188 52.4	08.5	14 37.8	51.3	164 43.1	143	14 56.6	+127
23	207 01.0	124 47.2	19.5	161 27.3	14.7	203 54.4	08.7	29 40.4	51.4	179 16.4	143	15 09.3	+127
0	222 03.5	139 46.5	+25 19.7	176 27.9	+17 15.2	218 56.4	+ 0 08.9	44 42.9	+ 3 51.4	193 49.7	143	+15 22.0	+126
1	237 05.9	154 45.8	19.9	191 28.6	15.7	233 58.4	09.1	59 45.5	51.4	208 23.0	142	15 34.6	+126
2	252 08.4	169 45.1	20.2	206 29.2	16.2	249 00.3	09.3	74 48.0	51.5	222 56.2	142	15 47.2	+125
3	267 10.9	184 44.4	·· 20.4	221 29.9	·· 16.8	264 02.3	·· 09.5	89 50.6	·· 51.5	237 29.4	141	·15 59.7	+124
4	282 13.3	199 43.6	20.7	236 30.5	17.3	279 04.3	09.7	104 53.1	51.5	252 02.5	141	16 12.1	+123
5	297 15.8	214 42.9	20.9	251 31.2	17.8	294 06.3	09.9	119 55.7	51.6	266 35.6	140	16 24.4	+122
6	312 18.3	229 42.2	+25 21.1	266 31.8	+17 18.4	309 08.2	+ 0 10.1	134 58.3	+ 3 51.6	281 08.6	140	+16 36.6	+122
7	327 20.7	244 41.5	21.4	281 32.5	18.9	324 10.2	10.3	150 00.8	51.6	295 41.6	140	16 48.8	+121
8	342 23.2	259 40.8	21.6	296 33.1	19.4	339 12.2	10.5	165 03.4	51.7	310 14.6	139	17 00.9	+120
9	357 25.6	274 40.0	·· 21.8	311 33.8	·· 19.9	354 14.2	·· 10.8	180 05.9	·· 51.7	324 47.5	138	·17 12.9	+120
10	12 28.1	289 39.3	22.1	326 34.4	20.5	9 16.2	11.0	195 08.5	51.7	339 20.3	138	17 24.9	+118
11	27 30.6	304 38.6	22.3	341 35.1	21.0	24 18.1	11.2	210 11.0	51.8	353 53.1	138	17 36.7	+118
12	42 33.0	319 37.9	+25 22.5	356 35.7	+17 21.5	39 20.1	+ 0 11.4	225 13.6	+ 3 51.8	8 25.9	137	+17 48.5	+117
13	57 35.5	334 37.2	22.7	11 36.4	22.0	54 22.1	11.6	240 16.2	51.8	22 58.6	137	18 00.2	+116
14	72 38.0	349 36.4	23.0	26 37.1	22.6	69 24.1	11.8	255 18.7	51.8	37 31.3	136	18 11.8	+116
15	87 40.4	4 35.7	·· 23.2	41 37.7	·· 23.1	84 26.0	·· 12.0	270 21.3	·· 51.9	52 03.9	135	·18 23.4	+114
16	102 42.9	19 35.0	23.4	56 38.4	23.6	99 28.0	12.2	285 23.8	51.9	66 36.4	135	18 34.8	+114
17	117 45.4	34 34.3	23.6	71 39.0	24.1	114 30.0	12.4	300 26.4	51.9	81 08.9	135	18 46.2	+112
18	132 47.8	49 33.6	+25 23.9	86 39.6	+17 24.7	129 32.0	+ 0 12.6	315 28.9	+ 3 52.0	95 41.4	134	+18 57.4	+112
19	147 50.3	64 32.8	24.1	101 40.3	25.2	144 34.0	12.8	330 31.5	52.0	110 13.8	134	19 08.6	+111
20	162 52.7	79 32.1	24.3	116 40.9	25.7	159 35.9	13.0	345 34.0	52.0	124 46.2	133	19 19.7	+111
21	177 55.2	94 31.4	·· 24.5	131 41.6	·· 26.2	174 37.9	·· 13.2	0 36.6	·· 52.1	139 18.5	132	·19 30.8	+109
22	192 57.7	109 30.7	24.7	146 42.2	26.8	189 39.9	13.4	15 39.2	52.1	153 50.7	132	19 41.7	+108
23	208 00.1	124 30.0	24.9	161 42.9	27.3	204 41.9	13.6	30 41.7	52.1	168 22.9	132	19 52.5	+107
0	223 02.6	139 29.3	+25 25.2	176 43.5	+17 27.8	219 43.9	+ 0 13.8	45 44.3	+ 3 52.2	182 55.1	130	+20 03.2	+107
1	238 05.1	154 28.5	25.4	191 44.2	28.3	234 45.8	14.0	60 46.8	52.2	197 27.1	131	20 13.9	+106
2	253 07.5	169 27.8	25.6	206 44.8	28.9	249 47.8	14.2	75 49.4	52.2	211 59.2	130	20 24.5	+104
3	268 10.0	184 27.1	·· 25.8	221 45.5	·· 29.4	264 49.8	·· 14.4	90 51.9	·· 52.3	226 31.2	129	·20 34.9	+104
4	283 12.5	199 26.4	26.0	236 46.1	29.9	279 51.8	14.6	105 54.5	52.3	241 03.1	129	20 45.3	+103
5	298 14.9	214 25.7	26.2	251 46.8	30.4	294 53.8	14.8	120 57.0	52.3	255 35.0	128	20 55.6	+101
6	313 17.4	229 24.9	+25 26.4	266 47.4	+17 30.9	309 55.7	+ 0 15.0	135 59.6	+ 3 52.4	270 06.8	128	+21 05.7	+101
7	328 19.9	244 24.2	26.6	281 48.1	31.5	324 57.7	15.2	151 02.1	52.4	284 38.6	127	21 15.8	+100
8	343 22.3	259 23.5	26.8	296 48.7	32.0	339 59.7	15.4	166 04.7	52.4	299 10.3	126	21 25.8	+ 99
9	358 24.8	274 22.8	·· 27.0	311 49.4	·· 32.5	355 01.7	·· 15.6	181 07.2	·· 52.4	313 41.9	126	·21 35.7	+ 97
10	13 27.2	289 22.1	27.2	326 50.0	33.0	10 03.7	15.8	196 09.8	52.5	328 13.5	126	21 45.4	+ 97
11	28 29.7	304 21.3	27.4	341 50.7	33.5	25 05.6	16.0	211 12.4	52.5	342 45.1	125	21 55.1	+ 96
12	43 32.2	319 20.6	+25 27.6	356 51.3	+17 34.1	40 07.6	+ 0 16.2	226 14.9	+ 3 52.5	357 16.6	124	+22 04.7	+ 95
13	58 34.6	334 19.9	27.8	11 52.0	34.6	55 09.6	16.4	241 17.5	52.6	11 48.0	124	22 14.2	+ 94
14	73 37.1	349 19.2	28.0	26 52.6	35.1	70 11.6	16.6	256 20.0	52.6	26 19.4	123	22 23.6	+ 92
15	88 39.6	4 18.5	·· 28.2	41 53.3	·· 35.6	85 13.6	·· 16.8	271 22.6	·· 52.6	40 50.7	123	·22 32.8	+ 92
16	103 42.0	19 17.8	28.4	56 53.9	36.1	100 15.6	17.0	286 25.1	52.7	55 22.0	122	22 42.0	+ 90
17	118 44.5	34 17.0	28.6	71 54.6	36.7	115 17.5	17.2	301 27.7	52.7	69 53.2	122	22 51.0	+ 90
18	133 47.0	49 16.3	+25 28.8	86 55.2	+17 37.2	130 19.5	+ 0 17.5	316 30.2	+ 3 52.7	84 24.4	121	+23 00.0	+ 88
19	148 49.4	64 15.6	29.0	101 55.9	37.7	145 21.5	17.7	331 32.8	52.8	98 55.5	120	23 08.8	+ 88
20	163 51.9	79 14.9	29.2	116 56.5	38.2	160 23.5	17.9	346 35.3	52.8	113 26.5	120	23 17.6	+ 86
21	178 54.4	94 14.2	·· 29.4	131 57.2	·· 38.7	175 25.5	·· 18.1	1 37.9	·· 52.8	127 57.5	120	·23 26.2	+ 85
22	193 56.8	109 13.5	29.6	146 57.8	39.2	190 27.4	18.3	16 40.4	52.8	142 28.5	119	23 34.7	+ 84
23	208 59.3	124 12.7	29.7	161 58.5	39.7	205 29.4	18.5	31 43.0	52.9	156 59.4	118	23 43.1	+ 83
24	224 01.7	139 12.0	+25 29.9	176 59.1	+17 40.3	220 31.4	+ 0 18.7	46 45.5	+ 3 52.9	171 30.2	118	+23 51.4	+ 82
code	—	− 7	+ 2	+ 7	+ 5	+ 20	+ 2	+ 26	0				

G C T	SUN GHA	SUN Dec.
h	° ′	° ′
0	180 47.4	+15 39.9
1	195 47.5	40.7
2	210 47.6	41.4
3	225 47.6	·· 42.1
4	240 47.7	42.9
5	255 47.8	43.6
6	270 47.8	+15 44.3
7	285 47.9	45.1
8	300 48.0	45.8
9	315 48.0	·· 46.5
10	330 48.1	47.3
11	345 48.1	48.0
12	0 48.2	+15 48.7
13	15 48.3	49.4
14	30 48.3	50.2
15	45 48.4	·· 50.9
16	60 48.4	51.6
17	75 48.5	52.4
18	90 48.6	+15 53.1
19	105 48.6	53.8
20	120 48.7	54.5
21	135 48.8	·· 55.3
22	150 48.8	56.0
23	165 48.9	56.7
0	180 48.9	+15 57.5
1	195 49.0	58.2
2	210 49.0	58.9
3	225 49.1	·15 59.6
4	240 49.2	16 00.3
5	255 49.2	01.1
6	270 49.3	+16 01.8
7	285 49.3	02.5
8	300 49.4	03.2
9	315 49.5	·· 04.0
10	330 49.5	04.7
11	345 49.6	05.4
12	0 49.6	+16 06.1
13	15 49.7	06.8
14	30 49.7	07.6
15	45 49.8	·· 08.3
16	60 49.8	09.0
17	75 49.9	09.7
18	90 50.0	+16 10.4
19	105 50.0	11.1
20	120 50.1	11.9
21	135 50.1	·· 12.6
22	150 50.2	13.3
23	165 50.2	14.0
0	180 50.3	+16 14.7
1	195 50.3	15.4
2	210 50.4	16.1
3	225 50.4	·· 16.9
4	240 50.5	17.6
5	255 50.5	18.3
6	270 50.6	+16 19.0
7	285 50.6	19.7
8	300 50.7	20.4
9	315 50.8	·· 21.1
10	330 50.8	21.8
11	345 50.9	22.5
12	0 50.9	+16 23.3
13	15 51.0	24.0
14	30 51.0	24.7
15	45 51.1	·· 25.4
16	60 51.1	26.1
17	75 51.2	26.8
18	90 51.2	+16 27.5
19	105 51.2	28.2
20	120 51.3	28.9
21	135 51.3	·· 29.6
22	150 51.4	30.3
23	165 51.4	31.0
24	180 51.5	+16 31.7
code	—	+7

No.	STARS SHA	Dec.	Transit Mer. Gr.
	° ′	° ′	h m
1	358 32.3	+28 49.1	9 16
2	358 22.1	+58 52.7	9 17
3	349 43.0	−18 15.2	9 51
4	339 21.6	+59 58.9	10 33
5	336 01.7	−57 28.9	10 46
6	333 00.2	+89 02.1	10 58
7	328 54.0	+23 14.0	11 14
8	315 54.1	−40 29.9	12 06
9	309 48.0	+49 41.5	12 31
10	291 43.4	+16 24.9	13 43
11	281 57.3	− 8 15.4	14 22
12	281 44.0	+45 57.3	14 22
13	279 22.4	+ 6 18.5	14 32
14	279 12.1	+28 34.2	14 33
15	276 34.1	− 1 13.8	14 43
16	271 52.2	+ 7 24.1	15 02
17	264 17.3	−52 40.2	15 32
18	259 15.1	−16 38.9	15 52
19	255 49.5	−28 54.4	16 06
20	245 48.8	+ 5 21.1	16 46
21	244 24.9	+28 08.9	16 51
22	234 37.5	−59 21.3	17 30
23	223 27.0	−43 14.3	18 15
24	221 50.1	−69 31.2	18 21
25	218 42.0	− 8 26.9	18 34
26	208 33.1	+12 12.4	19 14
27	194 48.2	+62 01.1	20 09
28	183 21.0	+14 50.6	20 55
29	174 01.5	−62 50.1	21 32
30	172 52.9	−56 50.7	21 37
31	168 46.7	−59 25.6	21 53
32	167 00.9	+56 13.5	22 00
33	159 29.7	+55 10.7	22 30
34	159 20.3	−10 54.7	22 31
35	153 35.0	+49 33.3	22 54
36	149 02.5	−36 08.1	23 12
37	146 38.0	+19 25.9	23 21
38	140 55.4	−60 38.4	23 44
39	137 16.1	+74 21.2	0 03
40	126 50.2	+26 52.4	0 44
41	120 37.9	−22 29.3	1 09
42	113 23.3	−26 19.7	1 38
43	109 06.8	−68 56.5	1 55
44	103 05.9	−15 40.2	2 19
45	97 25.1	−37 04.3	2 42
46	96 49.6	+12 35.4	2 44
47	91 07.5	+51 29.3	3 07
48	84 45.5	−34 24.7	3 32
49	81 10.4	+38 43.9	3 46
50	76 56.0	−26 21.6	4 03
51	62 53.7	+ 8 44.0	4 59
52	54 32.5	−56 53.5	5 33
53	50 03.4	+45 05.9	5 51
54	34 33.1	+ 9 38.8	6 52
55	28 42.3	−47 11.7	7 16
56	16 15.5	−29 52.8	8 05
57	14 25.1	+14 56.4	8 13

Lat.	Sunrise	Twlt. begins	Moonrise 4	5	6	7
N °	h m	h m	h m	h m	h m	h m
70	2 11	////	2 25	1 47	0 03	▭
68	2 42	////	2 38	2 12	1 28	▭
66	3 05	////	2 49	2 31	2 07	0 58
64	3 22	////	2 58	2 47	2 34	2 13
62	3 37	////	3 06	3 01	2 55	2 50
60	3 49	////	3 12	3 12	3 13	3 16
58	4 00	////	3 18	3 22	3 27	3 37
56	4 09	0 07	3 24	3 31	3 40	3 54
54	4 17	1 17	3 29	3 38	3 51	4 08
52	4 24	1 47	3 33	3 45	4 00	4 21
50	4 31	2 09	3 37	3 52	4 09	4 32
45	4 45	2 46	3 46	4 05	4 28	4 56
40	4 56	3 12	3 53	4 16	4 43	5 15
35	5 06	3 32	3 59	4 26	4 56	5 31
30	5 14	3 47	4 05	4 34	5 07	5 44
20	5 29	4 12	4 14	4 49	5 27	6 08
10	5 42	4 29	4 23	5 02	5 44	6 28
0	5 53	4 42	4 31	5 15	6 00	6 48
10	6 05	4 53	4 39	5 27	6 16	7 07
20	6 17	5 02	4 48	5 40	6 34	7 28
30	6 31	5 09	4 58	5 55	6 54	7 52
35	6 39	5 12	5 04	6 04	7 05	8 06
40	6 48	5 15	5 11	6 15	7 19	8 23
45	6 59	5 17	5 18	6 27	7 35	8 43
50	7 11	5 20	5 28	6 41	7 55	9 08
52	7 17	5 20	5 32	6 48	8 05	9 20
54	7 24	5 21	5 37	6 56	8 16	9 34
56	7 31	5 21	5 43	7 05	8 28	9 51
58	7 39	5 21	5 49	7 15	8 42	10 10
60	7 49	5 22	5 55	7 26	8 59	10 35
S						

Lat.	Sunset	Twlt. ends	Moonset 4	5	6	7
N °	h m	h m	h m	h m	h m	h m
70	21 47	////	19 57	23 15	▭	▭
68	21 15	////	19 33	21 51	▭	▭
66	20 52	////	19 15	21 13	24 00	0 00
64	20 33	////	19 01	20 47	22 46	▭
62	20 18	////	18 49	20 27	22 10	24 00
60	20 06	////	18 38	20 10	21 44	23 18
58	19 55	////	18 29	19 56	21 24	22 49
56	19 46	////	18 22	19 45	21 08	22 27
54	19 38	22 44	18 15	19 34	20 54	22 10
52	19 30	22 11	18 09	19 25	20 41	21 54
50	19 24	21 49	18 03	19 17	20 30	21 41
45	19 10	21 10	17 51	19 00	20 08	21 14
40	18 58	20 43	17 41	18 46	19 50	20 53
35	18 48	20 23	17 33	18 34	19 35	20 35
30	18 39	20 07	17 25	18 23	19 22	20 20
20	18 25	19 44	17 13	18 06	19 00	19 54
10	18 12	19 26	17 02	17 50	18 41	19 32
0	18 00	19 12	16 52	17 36	18 23	19 12
10	17 49	19 01	16 41	17 22	18 05	18 51
20	17 36	18 51	16 31	17 07	17 46	18 29
30	17 22	18 44	16 18	16 49	17 24	18 04
35	17 14	18 40	16 11	16 39	17 12	17 49
40	17 05	18 37	16 03	16 28	16 57	17 32
45	16 54	18 34	15 54	16 15	16 40	17 11
50	16 41	18 32	15 42	15 58	16 19	16 45
52	16 35	18 31	15 37	15 51	16 08	16 32
54	16 29	18 31	15 31	15 42	15 57	16 18
56	16 21	18 29	15 25	15 33	15 44	16 01
58	16 13	18 29	15 18	15 22	15 29	15 41
60	16 04	18 29	15 10	15 10	15 12	15 16
S						

Equation of Time (App.—Mean)

G C T	4	5	6
h	m s	m s	m s
0	+ 3 09.6	+ 3 15.6	+ 3 21.0
6	+ 3 11.2	+ 3 17.0	+ 3 22.3
12	+ 3 12.7	+ 3 18.4	+ 3 23.5
18	+ 3 14.2	+ 3 19.7	+ 3 24.7
24	+ 3 15.6	+ 3 21.0	+ 3 25.9

GCT of Transit Meridian of Greenwich

DAY	Moon	Venus	Mars	Jupiter	Saturn
	h m	h m	h m	h m	h m
4	10 41	14 41	12 15	9 26	21 02
5	11 25	14 42	12 14	9 23	20 58
6	12 11	14 43	12 13	9 20	20 54
7	13 00	14 44	12 12	9 17	20 49

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb	Venus	Mars
°	′	′	′
0			
30	0.2	0.1	0.1
45	0.2	0.1	0.0
60	0.2	0.1	0.0
75	0.2	0.0	0.0
90	0.2	0.0	0.0

Moon's Lower Limb
Add

Alt.	4	5	6
°	′	′	′
0			
4	13.4	12.9	12.5
8	13.4	12.9	12.5
12	13.4	12.9	12.5
16	13.4	12.9	12.6
20	13.5	13.0	12.6
24	13.5	13.0	12.7
28	13.6	13.1	12.7
32	13.6	13.2	12.8
36	13.7	13.2	12.9
40	13.7	13.3	13.0
44	13.8	13.4	13.1
48	13.9	13.5	13.2
52	14.0	13.6	13.4
56	14.1	13.7	13.5
60	14.2	13.9	13.6
64	14.3	14.0	13.8
68	14.4	14.1	13.9
72	14.5	14.3	14.1
76	14.6	14.4	14.2
80	14.7	14.5	14.4
84	14.9	14.7	14.6
88	15.0	14.8	14.7
90	15.1	14.9	14.9

Add to table, back cover

Moon's Upper Limb
Subtract

Alt.	4	5	6
°	′	′	′
0			
4	16.8	17.1	17.3
8	16.8	17.1	17.3
12	16.8	17.0	17.3
16	16.7	17.0	17.2
20	16.7	17.0	17.2
24	16.7	16.9	17.1
28	16.6	16.9	17.1
32	16.6	16.8	17.0
36	16.5	16.7	16.9
40	16.4	16.6	16.8
44	16.4	16.5	16.7
48	16.3	16.4	16.6
52	16.2	16.3	16.4
56	16.1	16.2	16.3
60	16.0	16.1	16.2
64	15.9	16.0	16.0
68	15.8	15.8	15.9
72	15.7	15.7	15.7
76	15.6	15.6	15.6
80	15.4	15.4	15.4
84	15.3	15.3	15.2
88	15.2	15.1	15.1
90	15.1	15.0	14.9

Subtract from table, back cover

New Moon 6

GCT	♈ GHA	VENUS −3.6 GHA	Dec.	MARS 1.6 GHA	Dec.	JUPITER −1.7 GHA	Dec.	SATURN 1.1 GHA	Dec.	MOON GHA	code	Dec.	code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
0	224 01.7	139 12.0	+25 29.9	176 59.1	+17 40.3	220 31.4	+ 0 18.7	46 45.5	+ 3 52.9	171 30.2	118	+23 51.4	+ 82
1	239 04.2	154 11.3	30.1	191 59.8	40.8	235 33.4	18.9	61 48.1	52.9	186 01.0	118	23 59.6	+ 81
2	254 06.7	169 10.6	30.3	207 00.4	41.3	250 35.4	19.1	76 50.6	53.0	200 31.8	116	24 07.7	+ 80
3	269 09.1	184 09.9	·· 30.5	222 01.0	·· 41.8	265 37.4	·· 19.3	91 53.2	·· 53.0	215 02.4	117	·24 15.7	+ 78
4	284 11.6	199 09.2	30.7	237 01.7	42.3	280 39.3	19.5	106 55.7	53.0	229 33.1	116	24 23.5	+ 77
5	299 14.1	214 08.4	30.8	252 02.3	42.8	295 41.3	19.7	121 58.3	53.0	244 03.7	115	24 31.2	+ 76
6	314 16.5	229 07.7	+25 31.0	267 03.0	+17 43.4	310 43.3	+ 0 19.9	137 00.8	+ 3 53.1	258 34.2	115	+24 38.8	+ 75
7	329 19.0	244 07.0	31.2	282 03.6	43.9	325 45.3	20.1	152 03.4	53.1	273 04.7	114	24 46.3	+ 74
8	344 21.5	259 06.3	31.4	297 04.3	44.4	340 47.3	20.3	167 05.9	53.1	287 35.1	114	24 53.7	+ 73
9	359 23.9	274 05.6	·· 31.5	312 04.9	·· 44.9	355 49.3	·· 20.5	182 08.5	·· 53.2	302 05.5	113	·25 01.0	+ 71
10	14 26.4	289 04.9	31.7	327 05.6	45.4	10 51.2	20.7	197 11.0	53.2	316 35.8	113	25 08.1	+ 71
11	29 28.9	304 04.1	31.9	342 06.2	45.9	25 53.2	20.9	212 13.6	53.2	331 06.1	112	25 15.2	+ 69
12	44 31.3	319 03.4	+25 32.1	357 06.9	+17 46.4	40 55.2	+ 0 21.1	227 16.1	+ 3 53.3	345 36.3	112	+25 22.1	+ 68
13	59 33.8	334 02.7	32.2	12 07.5	46.9	55 57.2	21.3	242 18.7	53.3	0 06.5	111	25 28.9	+ 66
14	74 36.2	349 02.0	32.4	27 08.2	47.4	70 59.2	21.5	257 21.2	53.3	14 36.6	111	25 35.5	+ 66
15	89 38.7	4 01.3	·· 32.6	42 08.8	·· 48.0	86 01.2	·· 21.7	272 23.8	·· 53.3	29 06.7	110	·25 42.1	+ 64
16	104 41.2	19 00.6	32.7	57 09.5	48.5	101 03.1	21.9	287 26.3	53.4	43 36.7	110	25 48.5	+ 63
17	119 43.6	33 59.8	32.9	72 10.1	49.0	116 05.1	22.1	302 28.9	53.4	58 06.7	110	25 54.8	+ 62
18	134 46.1	48 59.1	+25 33.1	87 10.7	+17 49.5	131 07.1	+ 0 22.3	317 31.4	+ 3 53.4	72 36.7	109	+26 01.0	+ 60
19	149 48.6	63 58.4	33.2	102 11.4	50.0	146 09.1	22.5	332 34.0	53.5	87 06.6	109	26 07.0	+ 59
20	164 51.0	78 57.7	33.4	117 12.0	50.5	161 11.1	22.7	347 36.5	53.5	101 36.5	108	26 12.9	+ 58
21	179 53.5	93 57.0	·· 33.5	132 12.7	·· 51.0	176 13.1	·· 22.9	2 39.1	·· 53.5	116 06.3	107	·26 18.7	+ 57
22	194 56.0	108 56.3	33.7	147 13.3	51.5	191 15.1	23.1	17 41.6	53.5	130 36.0	108	26 24.4	+ 56
23	209 58.4	123 55.5	33.9	162 14.0	52.0	206 17.0	23.3	32 44.2	53.6	145 05.8	107	26 30.0	+ 54
0	225 00.9	138 54.8	+25 34.0	177 14.6	+17 52.5	221 19.0	+ 0 23.5	47 46.7	+ 3 53.6	159 35.5	106	+26 35.4	+ 53
1	240 03.3	153 54.1	34.2	192 15.3	53.1	236 21.0	23.7	62 49.3	53.6	174 05.1	106	26 40.7	+ 52
2	255 05.8	168 53.4	34.3	207 15.9	53.6	251 23.0	23.9	77 51.8	53.7	188 34.7	106	26 45.9	+ 50
3	270 08.3	183 52.7	·· 34.5	222 16.6	·· 54.1	266 25.0	·· 24.1	92 54.4	·· 53.7	203 04.3	106	·26 50.9	+ 49
4	285 10.7	198 52.0	34.6	237 17.2	54.6	281 27.0	24.3	107 56.9	53.7	217 33.9	105	26 55.8	+ 48
5	300 13.2	213 51.3	34.8	252 17.8	55.1	296 28.9	24.5	122 59.5	53.7	232 03.4	104	27 00.6	+ 46
6	315 15.7	228 50.5	+25 34.9	267 18.5	+17 55.6	311 30.9	+ 0 24.7	138 02.0	+ 3 53.8	246 32.8	105	+27 05.2	+ 46
7	330 18.1	243 49.8	35.1	282 19.1	56.1	326 32.9	24.9	153 04.6	53.8	261 02.3	104	27 09.8	+ 44
8	345 20.6	258 49.1	35.2	297 19.8	56.6	341 34.9	25.1	168 07.1	53.8	275 31.7	103	27 14.2	+ 42
9	0 23.1	273 48.4	·· 35.4	312 20.4	·· 57.1	356 36.9	·· 25.3	183 09.6	·· 53.8	290 01.0	104	·27 18.4	+ 41
10	15 25.5	288 47.7	35.5	327 21.1	57.6	11 38.9	25.5	198 12.2	53.9	304 30.4	103	27 22.5	+ 40
11	30 28.0	303 47.0	35.7	342 21.7	58.1	26 40.9	25.7	213 14.7	53.9	318 59.7	102	27 26.5	+ 39
12	45 30.5	318 46.3	+25 35.8	357 22.4	+17 58.6	41 42.9	+ 0 25.9	228 17.3	+ 3 53.9	333 28.9	103	+27 30.4	+ 37
13	60 32.9	333 45.5	35.9	12 23.0	59.1	56 44.8	26.1	243 19.8	54.0	347 58.2	102	27 34.1	+ 36
14	75 35.4	348 44.8	36.1	27 23.6	17 59.6	71 46.8	26.3	258 22.4	54.0	2 27.4	102	27 37.7	+ 35
15	90 37.8	3 44.1	·· 36.2	42 24.3	·18 00.1	86 48.8	·· 26.5	273 24.9	·· 54.0	16 56.6	102	·27 41.2	+ 33
16	105 40.3	18 43.4	36.4	57 24.9	00.6	101 50.8	26.7	288 27.5	54.0	31 25.8	101	27 44.5	+ 32
17	120 42.8	33 42.7	36.5	72 25.6	01.1	116 52.8	26.9	303 30.0	54.1	45 54.9	101	27 47.7	+ 31
18	135 45.2	48 42.0	+25 36.6	87 26.2	+18 01.6	131 54.8	+ 0 27.1	318 32.6	+ 3 54.1	60 24.0	101	+27 50.8	+ 29
19	150 47.7	63 41.3	36.8	102 26.9	02.1	146 56.8	27.3	333 35.1	54.1	74 53.1	101	27 53.7	+ 28
20	165 50.2	78 40.6	36.9	117 27.5	02.6	161 58.7	27.5	348 37.6	54.1	89 22.2	100	27 56.5	+ 27
21	180 52.6	93 39.8	·· 37.0	132 28.2	·· 03.1	177 00.7	·· 27.7	3 40.2	·· 54.2	103 51.2	101	·27 59.2	+ 25
22	195 55.1	108 39.1	37.2	147 28.8	03.6	192 02.7	27.9	18 42.7	54.2	118 20.3	100	28 01.7	+ 24
23	210 57.6	123 38.4	37.3	162 29.4	04.1	207 04.7	28.1	33 45.3	54.2	132 49.3	100	28 04.1	+ 22
0	226 00.0	138 37.7	+25 37.4	177 30.1	+18 04.6	222 06.7	+ 0 28.3	48 47.8	+ 3 54.3	147 18.3	100	+28 06.3	+ 21
1	241 02.5	153 37.0	37.6	192 30.7	05.1	237 08.7	28.5	63 50.4	54.3	161 47.3	99	28 08.4	+ 20
2	256 05.0	168 36.3	37.7	207 31.4	05.6	252 10.7	28.7	78 52.9	54.3	176 16.2	100	28 10.4	+ 18
3	271 07.4	183 35.6	·· 37.8	222 32.0	·· 06.1	267 12.7	·· 28.9	93 55.5	·· 54.3	190 45.2	99	·28 12.2	+ 17
4	286 09.9	198 34.9	37.9	237 32.7	06.6	282 14.7	29.1	108 58.0	54.4	205 14.1	100	28 13.9	+ 16
5	301 12.3	213 34.1	38.0	252 33.3	07.1	297 16.6	29.3	124 00.5	54.4	219 43.1	99	28 15.5	+ 14
6	316 14.8	228 33.4	+25 38.2	267 33.9	+18 07.6	312 18.6	+ 0 29.5	139 03.1	+ 3 54.4	234 12.0	99	+28 16.9	+ 13
7	331 17.3	243 32.7	38.3	282 34.6	08.1	327 20.6	29.7	154 05.6	54.4	248 40.9	99	28 18.2	+ 12
8	346 19.7	258 32.0	38.4	297 35.2	08.6	342 22.6	29.9	169 08.2	54.5	263 09.8	99	28 19.4	+ 10
9	1 22.2	273 31.3	·· 38.5	312 35.9	·· 09.1	357 24.6	·· 30.1	184 10.7	·· 54.5	277 38.7	99	·28 20.4	+ 9
10	16 24.7	288 30.6	38.6	327 36.5	09.6	12 26.6	30.3	199 13.3	54.5	292 07.6	99	28 21.3	+ 7
11	31 27.1	303 29.9	38.8	342 37.2	10.1	27 28.6	30.5	214 15.8	54.5	306 36.5	99	28 22.0	+ 6
12	46 29.6	318 29.2	+25 38.9	357 37.8	+18 10.6	42 30.6	+ 0 30.7	229 18.3	+ 3 54.6	321 05.4	99	+28 22.6	+ 5
13	61 32.1	333 28.5	39.0	12 38.4	11.1	57 32.6	30.9	244 20.9	54.6	335 34.3	98	28 23.1	+ 3
14	76 34.5	348 27.7	39.1	27 39.1	11.6	72 34.5	31.1	259 23.4	54.6	350 03.1	99	28 23.4	+ 2
15	91 37.0	3 27.0	·· 39.2	42 39.7	·· 12.1	87 36.5	·· 31.3	274 26.0	·· 54.6	4 32.0	99	·28 23.6	+ 1
16	106 39.5	18 26.3	39.3	57 40.4	12.6	102 38.5	31.5	289 28.5	54.7	19 00.9	99	28 23.7	− 1
17	121 41.9	33 25.6	39.4	72 41.0	13.1	117 40.5	31.7	304 31.1	54.7	33 29.8	99	28 23.6	− 2
18	136 44.4	48 24.9	+25 39.5	87 41.6	+18 13.6	132 42.5	+ 0 31.9	319 33.6	+ 3 54.7	47 58.7	99	+28 23.4	− 4
19	151 46.8	63 24.2	39.6	102 42.3	14.1	147 44.5	32.1	334 36.1	54.7	62 27.6	99	28 23.0	− 5
20	166 49.3	78 23.5	39.7	117 42.9	14.6	162 46.5	32.3	349 38.7	54.8	76 56.5	99	28 22.5	− 6
21	181 51.8	93 22.8	·· 39.8	132 43.6	·· 15.1	177 48.5	·· 32.5	4 41.2	·· 54.8	91 25.4	99	·28 21.9	− 8
22	196 54.2	108 22.1	39.9	147 44.2	15.6	192 50.5	32.7	19 43.8	54.8	105 54.3	100	28 21.1	− 9
23	211 56.7	123 21.4	40.0	162 44.9	16.1	207 52.5	32.8	34 46.3	54.8	120 23.3	99	28 20.2	− 10
24	226 59.2	138 20.7	+25 40.1	177 45.5	+18 16.6	222 54.5	+ 0 33.0	49 48.8	+ 3 54.9	134 52.2	100	+28 19.2	− 12
code	—	− 8	+ 1	+ 6	+ 5	+ 19	+ 2	+ 25	+ 1				

GCT	SUN GHA	Dec.
h	° ′	° ′
0	180 51.5	+16 31.7
1	195 51.5	32.4
2	210 51.6	33.1
3	225 51.6 ··	33.8
4	240 51.7	34.5
5	255 51.7	35.2
6	270 51.8	+16 35.9
7	285 51.8	36.6
8	300 51.9	37.3
9	315 51.9 ··	38.0
10	330 52.0	38.7
11	345 52.0	39.4
12	0 52.0	+16 40.1
13	15 52.1	40.8
14	30 52.1	41.5
15	45 52.2 ··	42.2
16	60 52.2	42.9
17	75 52.3	43.6
18	90 52.3	+16 44.3
19	105 52.3	45.0
20	120 52.4	45.7
21	135 52.4 ··	46.4
22	150 52.5	47.1
23	165 52.5	47.8
0	180 52.6	+16 48.4
1	195 52.6	49.1
2	210 52.6	49.8
3	225 52.7 ··	50.5
4	240 52.7	51.2
5	255 52.8	51.9
6	270 52.8	+16 52.6
7	285 52.8	53.3
8	300 52.9	54.0
9	315 52.9 ··	54.6
10	330 53.0	55.3
11	345 53.0	56.0
12	0 53.0	+16 56.7
13	15 53.1	57.4
14	30 53.1	58.1
15	45 53.2 ··	58.8
16	60 53.2	16 59.4
17	75 53.2	17 00.1
18	90 53.3	+17 00.8
19	105 53.3	01.5
20	120 53.3	02.2
21	135 53.4 ··	02.8
22	150 53.4	03.5
23	165 53.5	04.2
0	180 53.5	+17 04.9
1	195 53.5	05.6
2	210 53.6	06.2
3	225 53.6 ··	06.9
4	240 53.6	07.6
5	255 53.7	08.3
6	270 53.7	+17 09.0
7	285 53.7	09.6
8	300 53.8	10.3
9	315 53.8 ··	11.0
10	330 53.8	11.7
11	345 53.9	12.3
12	0 53.9	+17 13.0
13	15 53.9	13.7
14	30 54.0	14.3
15	45 54.0 ··	15.0
16	60 54.0	15.7
17	75 54.1	16.4
18	90 54.1	+17 17.0
19	105 54.1	17.7
20	120 54.2	18.4
21	135 54.2 ··	19.0
22	150 54.2	19.7
23	165 54.3	20.4
24	180 54.3	+17 21.0
code	—	+7

STARS No.	SHA	Dec.	Transit Mer. Gr.
	° ′	° ′	h m
1	358 32.3	+28 49.1	9 04
2	358 22.1	+58 52.7	9 05
3	349 43.0	−18 15.2	9 39
4	339 21.6	+59 58.9	10 21
5	336 01.7	−57 28.9	10 34
6	332 59.8	+89 02.1	10 46
7	328 54.0	+23 14.0	11 03
8	315 54.1	−40 29.9	11 54
9	309 48.0	+49 41.5	12 19
10	291 43.4	+16 24.9	13 31
11	281 57.3	− 8 15.3	14 10
12	281 44.0	+45 57.2	14 11
13	279 22.4	+ 6 18.5	14 20
14	279 12.1	+28 34.2	14 21
15	276 34.1	− 1 13.8	14 31
16	271 52.2	+ 7 24.1	14 50
17	264 17.3	−52 40.2	15 20
18	259 15.1	−16 38.9	15 40
19	255 49.5	−28 54.4	15 54
20	245 48.8	+ 5 21.1	16 34
21	244 25.0	+28 08.9	16 40
22	234 37.5	−59 21.3	17 19
23	223 27.0	−43 14.3	18 03
24	221 50.2	−69 31.2	18 10
25	218 42.0	− 8 26.9	18 22
26	208 33.1	+12 12.4	19 03
27	194 48.3	+62 01.1	19 57
28	183 21.0	+14 50.6	20 43
29	174 01.5	−62 50.1	21 20
30	172 52.9	−56 50.7	21 25
31	168 46.8	−59 25.7	21 41
32	167 00.9	+56 13.5	21 48
33	159 29.7	+55 10.7	22 18
34	159 20.3	−10 54.7	22 19
35	153 35.0	+49 33.3	22 42
36	149 02.5	−36 08.1	23 00
37	146 38.0	+19 25.9	23 10
38	140 55.3	−60 38.4	23 32
39	137 16.1	+74 21.2	23 47
40	126 50.2	+26 52.4	0 33
41	120 37.9	−22 29.3	0 57
42	113 23.3	−26 19.7	1 26
43	109 06.8	−68 56.6	1 43
44	103 05.9	−15 40.2	2 07
45	97 25.1	−37 04.3	2 30
46	96 49.6	+12 35.4	2 32
47	91 07.5	+51 29.3	2 55
48	84 45.5	−34 24.7	3 20
49	81 10.4	+38 43.9	3 35
50	76 56.0	−26 21.6	3 52
51	62 53.7	+ 8 44.1	4 48
52	54 32.5	−56 53.5	5 21
53	50 03.4	+45 06.0	5 39
54	34 33.1	+ 9 38.9	6 41
55	28 42.3	−47 11.7	7 04
56	16 15.5	−29 52.8	7 54
57	14 25.1	+14 56.4	8 01

Lat.	Sunrise	Twlt. begins	Moonrise 7	8	9	10
N °	h m	h m	h m	h m	h m	h m
70	1 51	////	□	□	□	□
68	2 27	////	□	□	□	□
66	2 53	////	0 58	□	□	□
64	3 12	////	2 13	□	□	□
62	3 28	////	2 50	2 42	□	□
60	3 41	////	3 16	3 25	3 47	4 39
58	3 53	////	3 37	3 54	4 24	5 17
56	4 03	////	3 54	4 16	4 51	5 43
54	4 11	0 58	4 08	4 34	5 12	6 04
52	4 19	1 35	4 21	4 50	5 29	6 22
50	4 26	1 59	4 32	5 03	5 44	6 37
45	4 41	2 40	4 56	5 31	6 14	7 07
40	4 53	3 08	5 15	5 53	6 38	7 30
35	5 03	3 28	5 31	6 11	6 57	7 49
30	5 12	3 45	5 44	6 26	7 14	8 06
20	5 27	4 09	6 08	6 53	7 42	8 34
10	5 41	4 27	6 28	7 16	8 06	8 58
0	5 53	4 41	6 48	7 38	8 29	9 20
10	6 05	4 53	7 07	7 59	8 51	9 43
20	6 18	5 03	7 28	8 22	9 16	10 07
30	6 33	5 10	7 52	8 49	9 44	10 34
35	6 41	5 14	8 06	9 05	10 01	10 51
40	6 51	5 17	8 23	9 24	10 21	11 10
45	7 02	5 20	8 43	9 47	10 45	11 33
50	7 16	5 23	9 08	10 16	11 15	12 03
52	7 22	5 24	9 20	10 30	11 31	12 18
54	7 29	5 25	9 34	10 47	11 49	12 35
56	7 37	5 26	9 51	11 07	12 10	12 55
58	7 45	5 26	10 10	11 32	12 38	13 21
60	7 55	5 27	10 35	12 06	13 19	13 56
S						

Lat.	Sunset	Twlt. ends	Moonset 7	8	9	10
N °	h m	h m	h m	h m	h m	h m
70	22 08	////	□	□	□	□
68	21 29	////	□	□	□	□
66	21 03	////	0 00	□	□	□
64	20 43	////	□	□	□	□
62	20 27	////	24 00	0 00	□	□
60	20 13	////	23 18	24 41	0 41	1 36
58	20 02	////	22 49	24 04	0 04	0 59
56	19 52	////	22 27	23 38	24 32	0 32
54	19 43	23 04	22 10	23 17	24 11	0 11
52	19 35	22 23	21 54	23 00	23 54	24 34
50	19 28	21 58	21 41	22 45	23 39	24 21
45	19 13	21 16	21 14	22 15	23 09	23 53
40	19 01	20 48	20 53	21 52	22 45	23 31
35	18 50	20 26	20 35	21 33	22 25	23 12
30	18 41	20 10	20 20	21 16	22 09	22 56
20	18 26	19 45	19 54	20 48	21 41	22 30
10	18 12	19 26	19 32	20 24	21 16	22 06
0	18 00	19 12	19 12	20 02	20 54	21 45
10	17 48	19 01	18 51	19 40	20 31	21 23
20	17 35	18 51	18 29	19 16	20 07	21 00
30	17 20	18 42	18 04	18 48	19 38	20 32
35	17 12	18 39	17 49	18 32	19 21	20 16
40	17 02	18 35	17 32	18 13	19 02	19 57
45	16 51	18 32	17 11	17 50	18 38	19 34
50	16 37	18 28	16 45	17 20	18 07	19 05
52	16 31	18 28	16 32	17 06	17 52	18 51
54	16 24	18 27	16 18	16 49	17 34	18 34
56	16 16	18 25	16 01	16 29	17 12	18 14
58	16 07	18 24	15 41	16 04	16 44	17 48
60	15 57	18 23	15 16	15 29	16 04	17 13
S						

GCT	Equation of Time (App.—Mean) 7	8	9
h	m s	m s	m s
0	+ 3 25.9	+ 3 30.2	+ 3 33.9
6	+ 3 27.0	+ 3 31.2	+ 3 34.7
12	+ 3 28.1	+ 3 32.1	+ 3 35.6
18	+ 3 29.1	+ 3 33.0	+ 3 36.3
24	+ 3 30.2	+ 3 33.9	+ 3 37.1

GCT of Transit Meridian of Greenwich

DAY	Moon	Venus	Mars	Jupiter	Saturn
	h m	h m	h m	h m	h m
7	13 00	14 44	12 12	9 17	20 49
8	13 50	14 45	12 11	9 14	20 45
9	14 41	14 46	12 10	9 10	20 41
10	15 33	14 47	12 09	9 07	20 37

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb	Venus	Mars
°	′	′	′
0 – 30	0.2	0.1	0.1
30 – 45	0.2	0.1	0.0
45 – 60	0.2	0.1	0.0
60 – 75	0.2	0.0	0.0
75 – 90	0.2	0.0	0.0

Moon's Lower Limb
Add

Alt.	7	8	9
°	′	′	′
0 – 4	12.1	11.9	11.7
4 – 8	12.1	11.9	11.7
8 – 12	12.2	11.9	11.8
12 – 16	12.2	11.9	11.8
16 – 20	12.2	12.0	11.9
20 – 24	12.3	12.1	12.0
24 – 28	12.4	12.2	12.0
28 – 32	12.5	12.2	12.1
32 – 36	12.6	12.4	12.2
36 – 40	12.7	12.5	12.4
40 – 44	12.8	12.6	12.5
44 – 48	12.9	12.7	12.6
48 – 52	13.1	12.9	12.8
52 – 56	13.2	13.1	13.0
56 – 60	13.4	13.2	13.1
60 – 64	13.5	13.4	13.3
64 – 68	13.7	13.6	13.5
68 – 72	13.9	13.8	13.7
72 – 76	14.1	14.0	13.9
76 – 80	14.3	14.2	14.1
80 – 84	14.4	14.4	14.3
84 – 88	14.6	14.6	14.5
88 – 90	14.8	14.7	14.7

Add to table, back cover

Moon's Upper Limb
Subtract

Alt.	7	8	9
°	′	′	′
0 – 4	17.5	17.7	17.7
4 – 8	17.5	17.6	17.7
8 – 12	17.5	17.6	17.7
12 – 16	17.4	17.6	17.6
16 – 20	17.4	17.5	17.6
20 – 24	17.3	17.5	17.5
24 – 28	17.2	17.4	17.4
28 – 32	17.2	17.3	17.3
32 – 36	17.1	17.2	17.2
36 – 40	16.9	17.0	17.1
40 – 44	16.8	16.9	17.0
44 – 48	16.7	16.8	16.8
48 – 52	16.6	16.6	16.7
52 – 56	16.4	16.5	16.5
56 – 60	16.2	16.3	16.3
60 – 64	16.1	16.1	16.1
64 – 68	15.9	15.9	16.0
68 – 72	15.7	15.8	15.8
72 – 76	15.6	15.6	15.6
76 – 80	15.4	15.4	15.4
80 – 84	15.2	15.2	15.2
84 – 88	15.0	15.0	14.9
88 – 90	14.9	14.8	14.8

Subtract from table, back cover

GCT	♈	VENUS −3.6		MARS 1.6		JUPITER −1.7		SATURN 1.1		MOON			
	GHA	GHA	Dec.	GHA	Dec.	GHA	Dec.	GHA	Dec.	GHA	code	Dec.	code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
0	226 59.2	138 20.7	+25 40.1	177 45.5	+18 16.6	222 54.5	+ 0 33.0	49 48.8	+ 3 54.9	134 52.2	100	+28 19.2	− 12
1	242 01.6	153 19.9	40.2	192 46.1	17.1	237 56.4	33.2	64 51.4	54.9	149 21.2	100	28 18.0	− 13
2	257 04.1	168 19.2	40.3	207 46.8	17.6	252 58.4	33.4	79 53.9	54.9	163 50.2	99	28 16.7	− 15
3	272 06.6	183 18.5	·· 40.4	222 47.4	·· 18.0	268 00.4	·· 33.6	94 56.5	·· 54.9	178 19.1	100	·28 15.2	− 16
4	287 09.0	198 17.8	40.5	237 48.1	18.5	283 02.4	33.8	109 59.0	55.0	192 48.1	101	28 13.6	− 17
5	302 11.5	213 17.1	40.6	252 48.7	19.0	298 04.4	34.0	125 01.5	55.0	207 17.2	100	28 11.9	− 19
6	317 13.9	228 16.4	+25 40.7	267 49.3	+18 19.5	313 06.4	+ 0 34.2	140 04.1	+ 3 55.0	221 46.2	101	+28 10.0	− 20
7	332 16.4	243 15.7	40.8	282 50.0	20.0	328 08.4	34.4	155 06.6	55.0	236 15.3	100	28 08.0	− 21
8	347 18.9	258 15.0	40.9	297 50.6	20.5	343 10.4	34.6	170 09.2	55.1	250 44.3	101	28 05.9	− 23
9	2 21.3	273 14.3	·· 41.0	312 51.3	·· 21.0	358 12.4	·· 34.8	185 11.7	·· 55.1	265 13.4	102	·28 03.6	− 24
10	17 23.8	288 13.6	41.1	327 51.9	21.5	13 14.4	35.0	200 14.2	55.1	279 42.6	101	28 01.2	− 25
11	32 26.3	303 12.9	41.2	342 52.5	22.0	28 16.4	35.2	215 16.8	55.1	294 11.7	102	27 58.7	− 27
12	47 28.7	318 12.2	+25 41.2	357 53.2	+18 22.5	43 18.4	+ 0 35.4	230 19.3	+ 3 55.2	308 40.9	102	+27 56.0	− 28
13	62 31.2	333 11.5	41.3	12 53.8	23.0	58 20.3	35.6	245 21.9	55.2	323 10.1	102	27 53.2	− 29
14	77 33.7	348 10.7	41.4	27 54.5	23.4	73 22.3	35.8	260 24.4	55.2	337 39.3	102	27 50.3	− 31
15	92 36.1	3 10.0	·· 41.5	42 55.1	·· 23.9	88 24.3	·· 36.0	275 26.9	·· 55.2	352 08.5	103	·27 47.2	− 32
16	107 38.6	18 09.3	41.6	57 55.7	24.4	103 26.3	36.2	290 29.5	55.3	6 37.8	103	27 44.0	− 33
17	122 41.1	33 08.6	41.7	72 56.4	24.9	118 28.3	36.4	305 32.0	55.3	21 07.1	104	27 40.7	− 35
18	137 43.5	48 07.9	+25 41.7	87 57.0	+18 25.4	133 30.3	+ 0 36.6	320 34.5	+ 3 55.3	35 36.5	103	+27 37.2	− 36
19	152 46.0	63 07.2	41.8	102 57.7	25.9	148 32.3	36.8	335 37.1	55.3	50 05.8	104	27 33.6	− 37
20	167 48.4	78 06.5	41.9	117 58.3	26.4	163 34.3	37.0	350 39.6	55.4	64 35.2	105	27 29.9	− 39
21	182 50.9	93 05.8	·· 42.0	132 58.9	·· 26.9	178 36.3	·· 37.2	5 42.2	·· 55.4	79 04.7	104	·27 26.0	− 40
22	197 53.4	108 05.1	42.0	147 59.6	27.3	193 38.3	37.4	20 44.7	55.4	93 34.1	105	27 22.0	− 41
23	212 55.8	123 04.4	42.1	163 00.2	27.8	208 40.3	37.6	35 47.2	55.4	108 03.6	106	27 17.9	− 42
0	227 58.3	138 03.7	+25 42.2	178 00.9	+18 28.3	223 42.3	+ 0 37.8	50 49.8	+ 3 55.4	122 33.2	106	+27 13.7	− 44
1	243 00.8	153 03.0	42.2	193 01.5	28.8	238 44.3	38.0	65 52.3	55.5	137 02.8	106	27 09.3	− 45
2	258 03.2	168 02.3	42.3	208 02.1	29.3	253 46.3	38.2	80 54.8	55.5	151 32.4	106	27 04.8	− 47
3	273 05.7	183 01.6	·· 42.4	223 02.8	·· 29.8	268 48.2	·· 38.4	95 57.4	·· 55.5	166 02.0	107	·27 00.1	− 47
4	288 08.2	198 00.9	42.5	238 03.4	30.3	283 50.2	38.6	110 59.9	55.5	180 31.7	107	26 55.4	− 49
5	303 10.6	213 00.2	42.5	253 04.1	30.7	298 52.2	38.8	126 02.4	55.6	195 01.4	108	26 50.5	− 51
6	318 13.1	227 59.5	+25 42.6	268 04.7	+18 31.2	313 54.2	+ 0 39.0	141 05.0	+ 3 55.6	209 31.2	108	+26 45.4	− 51
7	333 15.6	242 58.8	42.6	283 05.3	31.7	328 56.2	39.1	156 07.5	55.6	224 01.0	109	26 40.3	− 53
8	348 18.0	257 58.1	42.7	298 06.0	32.2	343 58.2	39.3	171 10.1	55.6	238 30.9	108	26 35.0	− 54
9	3 20.5	272 57.4	·· 42.8	313 06.6	·· 32.7	359 00.2	·· 39.5	186 12.6	·· 55.7	253 00.7	110	·26 29.6	− 55
10	18 22.9	287 56.7	42.8	328 07.3	33.2	14 02.2	39.7	201 15.1	55.7	267 30.7	110	26 24.1	− 56
11	33 25.4	302 56.0	42.9	343 07.9	33.6	29 04.2	39.9	216 17.7	55.7	282 00.7	110	26 18.5	− 58
12	48 27.9	317 55.3	+25 42.9	358 08.5	+18 34.1	44 06.2	+ 0 40.1	231 20.2	+ 3 55.7	296 30.7	110	+26 12.7	− 59
13	63 30.3	332 54.6	43.0	13 09.2	34.6	59 08.2	40.3	246 22.7	55.7	311 00.7	111	26 06.8	− 60
14	78 32.8	347 53.9	43.0	28 09.8	35.1	74 10.2	40.5	261 25.3	55.8	325 30.8	112	26 00.8	− 62
15	93 35.3	2 53.2	·· 43.1	43 10.5	·· 35.6	89 12.2	·· 40.7	276 27.8	·· 55.8	340 01.0	112	·25 54.6	− 62
16	108 37.7	17 52.5	43.2	58 11.1	36.0	104 14.2	40.9	291 30.3	55.8	354 31.2	112	25 48.4	− 64
17	123 40.2	32 51.8	43.2	73 11.7	36.5	119 16.2	41.1	306 32.9	55.8	9 01.4	113	25 42.0	− 65
18	138 42.7	47 51.1	+25 43.3	88 12.4	+18 37.0	134 18.2	+ 0 41.3	321 35.4	+ 3 55.8	23 31.7	114	+25 35.5	− 66
19	153 45.1	62 50.4	43.3	103 13.0	37.5	149 20.2	41.5	336 37.9	55.9	38 02.1	114	25 28.9	− 68
20	168 47.6	77 49.7	43.4	118 13.6	38.0	164 22.2	41.7	351 40.5	55.9	52 32.5	114	25 22.1	− 68
21	183 50.1	92 49.0	·· 43.4	133 14.3	·· 38.4	179 24.2	·· 41.9	6 43.0	·· 55.9	67 02.9	115	·25 15.3	− 70
22	198 52.5	107 48.3	43.4	148 14.9	38.9	194 26.2	42.1	21 45.5	55.9	81 33.4	115	25 08.3	− 71
23	213 55.0	122 47.6	43.5	163 15.6	39.4	209 28.2	42.3	36 48.1	56.0	96 03.9	116	25 01.2	− 72
0	228 57.4	137 46.9	+25 43.5	178 16.2	+18 39.9	224 30.2	+ 0 42.5	51 50.6	+ 3 56.0	110 34.5	116	+24 54.0	− 73
1	243 59.9	152 46.2	43.6	193 16.8	40.4	239 32.2	42.7	66 53.1	56.0	125 05.1	117	24 46.7	− 75
2	259 02.4	167 45.5	43.6	208 17.5	40.8	254 34.1	42.9	81 55.7	56.0	139 35.8	117	24 39.2	− 75
3	274 04.8	182 44.8	·· 43.6	223 18.1	·· 41.3	269 36.1	·· 43.1	96 58.2	·· 56.0	154 06.5	118	·24 31.7	− 77
4	289 07.3	197 44.1	43.7	238 18.7	41.8	284 38.1	43.2	112 00.7	56.1	168 37.3	118	24 24.0	− 78
5	304 09.8	212 43.4	43.7	253 19.4	42.3	299 40.1	43.4	127 03.3	56.1	183 08.1	118	24 16.2	− 79
6	319 12.2	227 42.7	+25 43.8	268 20.0	+18 42.7	314 42.1	+ 0 43.6	142 05.8	+ 3 56.1	197 38.9	120	+24 08.3	− 80
7	334 14.7	242 42.0	43.8	283 20.7	43.2	329 44.1	43.8	157 08.3	56.1	212 09.9	119	24 00.3	− 81
8	349 17.2	257 41.3	43.8	298 21.3	43.7	344 46.1	44.0	172 10.9	56.1	226 40.8	121	23 52.2	− 83
9	4 19.6	272 40.6	·· 43.9	313 21.9	·· 44.2	359 48.1	·· 44.2	187 13.4	·· 56.2	241 11.9	120	·23 43.9	− 83
10	19 22.1	287 39.9	43.9	328 22.6	44.6	14 50.1	44.4	202 15.9	56.2	255 42.9	121	23 35.6	− 85
11	34 24.6	302 39.2	43.9	343 23.2	45.1	29 52.1	44.6	217 18.5	56.2	270 14.0	122	23 27.1	− 85
12	49 27.0	317 38.5	+25 43.9	358 23.8	+18 45.6	44 54.1	+ 0 44.8	232 21.0	+ 3 56.2	284 45.2	122	+23 18.6	− 87
13	64 29.5	332 37.8	44.0	13 24.5	46.1	59 56.1	45.0	247 23.5	56.3	299 16.4	123	23 09.9	− 88
14	79 31.9	347 37.1	44.0	28 25.1	46.5	74 58.1	45.2	262 26.1	56.3	313 47.7	123	23 01.1	− 89
15	94 34.4	2 36.4	·· 44.0	43 25.7	·· 47.0	90 00.1	·· 45.4	277 28.6	·· 56.3	328 19.0	124	·22 52.2	− 89
16	109 36.9	17 35.7	44.1	58 26.4	47.5	105 02.1	45.6	292 31.1	56.3	342 50.4	124	22 43.3	− 91
17	124 39.3	32 35.0	44.1	73 27.0	48.0	120 04.1	45.8	307 33.6	56.3	357 21.8	125	22 34.2	− 93
18	139 41.8	47 34.3	+25 44.1	88 27.7	+18 48.4	135 06.1	+ 0 46.0	322 36.2	+ 3 56.4	11 53.3	125	+22 24.9	− 93
19	154 44.3	62 33.6	44.1	103 28.3	48.9	150 08.1	46.2	337 38.7	56.4	26 24.8	125	22 15.6	− 94
20	169 46.7	77 32.9	44.1	118 28.9	49.4	165 10.1	46.4	352 41.2	56.4	40 56.3	126	22 06.2	− 95
21	184 49.2	92 32.2	·· 44.2	133 29.6	·· 49.8	180 12.1	·· 46.5	7 43.8	·· 56.4	55 27.9	127	·21 56.7	− 96
22	199 51.7	107 31.5	44.2	148 30.2	50.3	195 14.1	46.7	22 46.3	56.4	69 59.6	127	21 47.1	− 97
23	214 54.1	122 30.8	44.2	163 30.8	50.8	210 16.1	46.9	37 48.8	56.5	84 31.3	128	21 37.4	− 98
24	229 56.6	137 30.1	+25 44.2	178 31.5	+18 51.3	225 18.1	+ 0 47.1	52 51.4	+ 3 56.5	99 03.1	128	+21 27.6	−100
code	—	− 7	+ 1	+ 7	+ 5	+ 20	+ 2	+ 25	0				

GCT (h)	SUN GHA (° ′)	SUN Dec. (° ′)
0	180 54.3	+17 21.0
1	195 54.3	21.7
2	210 54.3	22.4
3	225 54.4	•• 23.0
4	240 54.4	23.7
5	255 54.4	24.4
6	270 54.5	+17 25.0
7	285 54.5	25.7
8	300 54.5	26.4
9	315 54.5	•• 27.0
10	330 54.6	27.7
11	345 54.6	28.3
12	0 54.6	+17 29.0
13	15 54.6	29.7
14	30 54.7	30.3
15	45 54.7	•• 31.0
16	60 54.7	31.6
17	75 54.8	32.3
18	90 54.8	+17 33.0
19	105 54.8	33.6
20	120 54.8	34.3
21	135 54.9	•• 34.9
22	150 54.9	35.6
23	165 54.9	36.2
0	180 54.9	+17 36.9
1	195 55.0	37.6
2	210 55.0	38.2
3	225 55.0	•• 38.9
4	240 55.0	39.5
5	255 55.0	40.2
6	270 55.1	+17 40.8
7	285 55.1	41.5
8	300 55.1	42.1
9	315 55.1	•• 42.8
10	330 55.2	43.4
11	345 55.2	44.1
12	0 55.2	+17 44.7
13	15 55.2	45.4
14	30 55.2	46.0
15	45 55.3	•• 46.7
16	60 55.3	47.3
17	75 55.3	48.0
18	90 55.3	+17 48.6
19	105 55.3	49.3
20	120 55.4	49.9
21	135 55.4	•• 50.5
22	150 55.4	51.2
23	165 55.4	51.8
0	180 55.4	+17 52.5
1	195 55.5	53.1
2	210 55.5	53.8
3	225 55.5	•• 54.4
4	240 55.5	55.0
5	255 55.5	55.7
6	270 55.5	+17 56.3
7	285 55.6	57.0
8	300 55.6	57.6
9	315 55.6	•• 58.2
10	330 55.6	58.9
11	345 55.6	17 59.5
12	0 55.6	+18 00.1
13	15 55.7	18 00.8
14	30 55.7	01.4
15	45 55.7	•• 02.1
16	60 55.7	02.7
17	75 55.7	03.3
18	90 55.7	+18 04.0
19	105 55.7	04.6
20	120 55.8	05.2
21	135 55.8	•• 05.8
22	150 55.8	06.5
23	165 55.8	07.1
24	180 55.8	+18 07.7
code	—	+ 7

STARS No.	SHA (° ′)	Dec. (° ′)	Transit Mer. Gr. (h m)
1	358 32.3	+28 49.1	8 53
2	358 22.1	+58 52.7	8 53
3	349 42.9	−18 15.2	9 28
4	339 21.5	+59 58.9	10 09
5	336 01.7	−57 28.8	10 22
6	332 59.3	+89 02.1	10 34
7	328 54.0	+23 14.0	10 51
8	315 54.1	−40 29.8	11 43
9	309 48.0	+49 41.4	12 07
10	291 43.4	+16 24.9	13 19
11	281 57.3	− 8 15.3	13 58
12	281 44.0	+45 57.2	13 59
13	279 22.4	+ 6 18.5	14 08
14	279 12.1	+28 34.2	14 09
15	276 34.1	− 1 13.8	14 19
16	271 52.2	+ 7 24.1	14 38
17	264 17.3	−52 40.2	15 08
18	259 15.1	−16 38.9	15 29
19	255 49.5	−28 54.8	15 42
20	245 48.8	+ 5 21.1	16 22
21	244 25.0	+28 08.9	16 28
22	234 37.6	−59 21.3	17 07
23	223 27.0	−43 14.3	17 51
24	221 50.2	−69 31.2	17 58
25	218 42.0	− 8 26.9	18 10
26	208 33.1	+12 12.4	18 51
27	194 48.3	+62 01.1	19 46
28	183 21.0	+14 50.6	20 31
29	174 01.5	−62 50.1	21 09
30	172 52.9	−56 50.7	21 13
31	168 46.8	−59 25.7	21 29
32	167 00.9	+56 13.5	21 37
33	159 29.7	+55 10.8	22 06
34	159 20.3	−10 54.7	22 07
35	153 35.0	+49 33.3	22 30
36	149 02.5	−36 08.1	22 48
37	146 38.0	+19 26.0	22 58
38	140 55.3	−60 38.5	23 21
39	137 16.1	+74 21.2	23 35
40	126 50.2	+26 52.4	0 21
41	120 37.8	−22 29.3	0 45
42	113 23.3	−26 19.7	1 14
43	109 06.7	−68 56.6	1 31
44	103 05.9	−15 40.2	1 55
45	97 25.1	−37 04.3	2 18
46	96 49.5	+12 35.4	2 20
47	91 07.4	+51 29.3	2 43
48	84 45.5	−34 24.7	3 09
49	81 10.3	+38 43.9	3 23
50	76 56.0	−26 21.6	3 40
51	62 53.7	+ 8 44.1	4 36
52	54 32.4	−56 53.5	5 09
53	50 03.4	+45 06.0	5 27
54	34 33.0	+ 9 38.9	6 29
55	28 42.2	−47 11.7	6 52
56	16 15.5	−29 52.8	7 42
57	14 25.1	+14 56.4	7 49

Lat. (°)	Sunrise (h m)	Twlt. begins (h m)	Moonrise 10 (h m)	Moonrise 11 (h m)	Moonrise 12 (h m)	Moonrise 13 (h m)
N 70	1 29	////	□	□	□	□
68	2 12	////	□	□	□	7 17
66	2 41	////	□	□	□	7 59
64	3 02	////	□	□	6 27	8 28
62	3 20	////	□	5 15	7 06	8 49
60	3 34	////	4 39	6 00	7 33	9 07
58	3 46	////	5 17	6 30	7 54	9 21
56	3 56	////	5 43	6 52	8 11	9 33
54	4 06	0 31	6 04	7 10	8 25	9 44
52	4 14	1 21	6 22	7 26	8 38	9 54
50	4 21	1 50	6 37	7 39	8 49	10 02
45	4 37	2 34	7 07	8 07	9 12	10 20
40	4 49	3 03	7 30	8 28	9 31	10 34
35	5 00	3 24	7 49	8 46	9 46	10 47
30	5 10	3 41	8 06	9 02	9 59	10 57
20	5 26	4 07	8 34	9 28	10 22	11 16
10	5 40	4 26	8 58	9 50	10 41	11 31
0	5 53	4 41	9 20	10 11	10 59	11 46
10	6 06	4 53	9 43	10 32	11 18	12 01
20	6 19	5 03	10 07	10 54	11 37	12 17
30	6 35	5 12	10 34	11 19	11 59	12 34
35	6 44	5 16	10 51	11 34	12 12	12 45
40	6 54	5 20	11 10	11 52	12 27	12 56
45	7 06	5 24	11 33	12 13	12 45	13 10
50	7 20	5 27	12 03	12 39	13 06	13 27
52	7 27	5 28	12 18	12 52	13 17	13 35
54	7 34	5 29	12 35	13 07	13 28	13 44
56	7 43	5 31	12 55	13 24	13 42	13 53
58	7 52	5 32	13 21	13 44	13 57	14 05
S 60	8 03	5 32	13 56	14 10	14 16	14 17

Lat. (°)	Sunset (h m)	Twlt. ends (h m)	Moonset 10 (h m)	Moonset 11 (h m)	Moonset 12 (h m)	Moonset 13 (h m)
N 70	22 31	////	□	□	□	□
68	21 45	////	□	□	□	4 08
66	21 15	////	□	□	□	3 24
64	20 53	////	□	□	3 18	2 55
62	20 35	////	□	2 47	2 38	2 33
60	20 21	////	1 36	2 01	2 11	2 15
58	20 08	////	0 59	1 32	1 50	1 59
56	19 58	////	0 32	1 09	1 32	1 46
54	19 48	23 37	0 11	0 50	1 17	1 35
52	19 40	22 37	24 34	0 34	1 04	1 25
50	19 33	22 08	24 21	0 21	0 52	1 16
45	19 17	21 22	23 53	24 28	0 28	0 57
40	19 04	20 52	23 31	24 09	0 09	0 41
35	18 53	20 30	23 12	23 53	24 28	0 28
30	18 43	20 13	22 56	23 39	24 16	0 16
20	18 27	19 47	22 30	23 15	23 56	24 34
10	18 13	19 27	22 06	22 54	23 39	24 21
0	18 00	19 12	21 45	22 35	23 22	24 08
10	17 47	19 00	21 23	22 15	23 06	23 55
20	17 33	18 49	21 00	21 54	22 48	23 41
30	17 18	18 40	20 32	21 29	22 27	23 25
35	17 09	18 36	20 16	21 15	22 15	23 16
40	16 58	18 31	19 57	20 58	22 01	23 06
45	16 47	18 28	19 34	20 38	21 45	22 53
50	16 32	18 24	19 05	20 12	21 24	22 37
52	16 25	18 22	18 51	19 59	21 14	22 30
54	16 18	18 22	18 34	19 45	21 03	22 22
56	16 10	18 21	18 14	19 28	20 50	22 13
58	16 00	18 19	17 48	19 08	20 35	22 03
S 60	15 49	18 17	17 13	18 43	20 17	21 51

G C T (h)	Equation of Time (App.—Mean) 10 (m s)	11 (m s)	12 (m s)
0	+ 3 37.1	+ 3 39.7	+ 3 41.7
6	+ 3 37.8	+ 3 40.2	+ 3 42.1
12	+ 3 38.4	+ 3 40.8	+ 3 42.5
18	+ 3 39.1	+ 3 41.3	+ 3 42.9
24	+ 3 39.7	+ 3 41.7	+ 3 43.2

GCT of Transit Meridian of Greenwich

DAY	Moon (h m)	Venus (h m)	Mars (h m)	Jupiter (h m)	Saturn (h m)
10	15 33	14 47	12 09	9 07	20 37
11	16 23	14 49	12 07	9 04	20 33
12	17 11	14 50	12 06	9 01	20 29
13	17 57	14 51	12 05	8 58	20 25

ADDITIONAL ALTITUDE CORRECTIONS

Alt. (°)	Sun's Low'r Limb (′)	Venus (′)	Mars (′)
0	0.2	0.1	0.1
30	0.2	0.1	0.0
45	0.2	0.1	0.0
60	0.2	0.1	0.0
75	0.2	0.0	0.0
90			

Moon's Lower Limb
Add

Alt. (°)	10 (′)	11 (′)	12 (′)
0	11.9	12.0	12.5
4	11.9	12.0	12.5
8	11.9	12.0	12.5
12	11.9	12.1	12.6
16	12.0	12.1	12.6
20	12.1	12.2	12.7
24	12.2	12.3	12.7
28	12.2	12.4	12.8
32	12.4	12.5	12.9
36	12.5	12.6	13.0
40	12.6	12.7	13.1
44	12.7	12.8	13.2
48	12.9	13.0	13.4
52	13.1	13.1	13.5
56	13.2	13.3	13.6
60	13.4	13.5	13.8
64	13.6	13.6	13.9
68	13.8	13.8	14.1
72	14.0	14.0	14.2
76	14.2	14.2	14.4
80	14.4	14.4	14.6
84	14.6	14.6	14.7
88	14.7	14.7	14.9
90			

Add to table, back cover

Moon's Upper Limb
Subtract

Alt. (°)	10 (′)	11 (′)	12 (′)
0	17.7	17.6	17.3
4	17.6	17.6	17.3
8	17.6	17.5	17.3
12	17.6	17.5	17.2
16	17.5	17.5	17.2
20	17.5	17.4	17.1
24	17.4	17.3	17.1
28	17.3	17.2	17.0
32	17.2	17.1	16.9
36	17.0	17.0	16.8
40	16.9	16.9	16.7
44	16.8	16.7	16.6
48	16.6	16.6	16.4
52	16.5	16.4	16.3
56	16.3	16.3	16.2
60	16.1	16.1	16.0
64	15.9	15.9	15.9
68	15.8	15.7	15.7
72	15.6	15.6	15.6
76	15.4	15.4	15.4
80	15.2	15.2	15.2
84	15.0	15.0	15.1
88	14.8	14.8	14.9
90			

Subtract from table, back cover

GCT	♈ GHA	VENUS −3.6 GHA	VENUS Dec.	MARS 1.6 GHA	MARS Dec.	JUPITER −1.7 GHA	JUPITER Dec.	SATURN 1.1 GHA	SATURN Dec.	MOON GHA	code	MOON Dec.	code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
0	229 56.6	137 30.1	+25 44.2	178 31.5	+18 51.3	225 18.1	+ 0 47.1	52 51.4	+ 3 56.5	99 03.1	128	+21 27.6	−100
1	244 59.0	152 29.5	44.2	193 32.1	51.7	240 20.1	47.3	67 53.9	56.5	113 34.9	128	21 17.6	−100
2	260 01.5	167 28.8	44.2	208 32.7	52.2	255 22.1	47.5	82 56.4	56.5	128 06.7	129	21 07.6	−101
3	275 04.0	182 28.1	44.2	223 33.4	52.7	270 24.1	47.7	97 58.9	56.5	142 38.6	130	20 57.5	−102
4	290 06.4	197 27.4	44.2	238 34.0	53.1	285 26.1	47.9	113 01.5	56.6	157 10.6	129	20 47.3	−103
5	305 08.9	212 26.7	44.3	253 34.6	53.6	300 28.1	48.1	128 04.0	56.6	171 42.5	131	20 37.0	−104
6	320 11.4	227 26.0	+25 44.3	268 35.3	+18 54.1	315 30.1	+ 0 48.3	143 06.5	+ 3 56.6	186 14.6	131	+20 26.6	−106
7	335 13.8	242 25.3	44.3	283 35.9	54.5	330 32.1	48.5	158 09.1	56.6	200 46.7	131	20 16.0	−106
8	350 16.3	257 24.6	44.3	298 36.6	55.0	345 34.1	48.7	173 11.6	56.6	215 18.8	132	20 05.4	−107
9	5 18.8	272 23.9	44.3	313 37.2	55.5	0 36.1	48.9	188 14.1	56.6	229 51.0	132	19 54.7	−107
10	20 21.2	287 23.2	44.3	328 37.8	55.9	15 38.1	49.1	203 16.6	56.7	244 23.2	132	19 44.0	−109
11	35 23.7	302 22.5	44.3	343 38.5	56.4	30 40.1	49.2	218 19.2	56.7	258 55.4	133	19 33.1	−110
12	50 26.2	317 21.8	+25 44.3	358 39.1	+18 56.9	45 42.1	+ 0 49.4	233 21.7	+ 3 56.7	273 27.7	134	+19 22.1	−111
13	65 28.6	332 21.2	44.3	13 39.7	57.3	60 44.1	49.6	248 24.2	56.7	288 00.1	134	19 11.0	−111
14	80 31.1	347 20.5	44.3	28 40.4	57.8	75 46.1	49.8	263 26.8	56.7	302 32.5	134	18 59.9	−113
15	95 33.5	2 19.8	44.3	43 41.0	58.3	90 48.1	50.0	278 29.3	56.8	317 04.9	135	18 48.6	−113
16	110 36.0	17 19.1	44.3	58 41.6	58.7	105 50.1	50.2	293 31.8	56.8	331 37.4	135	18 37.3	−115
17	125 38.5	32 18.4	44.3	73 42.3	59.2	120 52.1	50.4	308 34.3	56.8	346 09.9	135	18 25.8	−115
18	140 40.9	47 17.7	+25 44.3	88 42.9	+18 59.7	135 54.1	+ 0 50.6	323 36.9	+ 3 56.8	0 42.4	136	+18 14.3	−116
19	155 43.4	62 17.0	44.2	103 43.5	19 00.1	150 56.1	50.8	338 39.4	56.8	15 15.0	136	18 02.7	−117
20	170 45.9	77 16.3	44.2	118 44.2	00.6	165 58.1	51.0	353 41.9	56.9	29 47.6	137	17 51.0	−118
21	185 48.3	92 15.7	44.2	133 44.8	01.1	181 00.1	51.2	8 44.4	56.9	44 20.3	137	17 39.2	−118
22	200 50.8	107 15.0	44.2	148 45.4	01.5	196 02.1	51.4	23 47.0	56.9	58 53.0	138	17 27.4	−120
23	215 53.3	122 14.3	44.2	163 46.1	02.0	211 04.1	51.6	38 49.5	56.9	73 25.8	137	17 15.4	−120
0	230 55.7	137 13.6	+25 44.2	178 46.7	+19 02.4	226 06.1	+ 0 51.7	53 52.0	+ 3 56.9	87 58.5	138	+17 03.4	−121
1	245 58.2	152 12.9	44.2	193 47.3	02.9	241 08.2	51.9	68 54.5	56.9	102 31.3	139	16 51.3	−122
2	261 00.7	167 12.2	44.2	208 48.0	03.4	256 10.2	52.1	83 57.1	57.0	117 04.2	139	16 39.1	−123
3	276 03.1	182 11.5	44.1	223 48.6	03.8	271 12.2	52.3	98 59.6	57.0	131 37.1	139	16 26.8	−124
4	291 05.6	197 10.8	44.1	238 49.2	04.3	286 14.2	52.5	114 02.1	57.0	146 10.0	139	16 14.4	−124
5	306 08.0	212 10.2	44.1	253 49.9	04.8	301 16.2	52.7	129 04.6	57.0	160 42.9	140	16 02.0	−126
6	321 10.5	227 09.5	+25 44.1	268 50.5	+19 05.2	316 18.2	+ 0 52.9	144 07.2	+ 3 57.0	175 15.9	140	+15 49.4	−126
7	336 13.0	242 08.8	44.1	283 51.1	05.7	331 20.2	53.1	159 09.7	57.1	189 48.9	140	15 36.8	−127
8	351 15.4	257 08.1	44.0	298 51.8	06.1	346 22.2	53.3	174 12.2	57.1	204 21.9	141	15 24.1	−127
9	6 17.9	272 07.4	44.0	313 52.4	06.6	1 24.2	53.5	189 14.7	57.1	218 55.0	141	15 11.4	−129
10	21 20.4	287 06.7	44.0	328 53.0	07.1	16 26.2	53.7	204 17.3	57.1	233 28.1	141	14 58.5	−129
11	36 22.8	302 06.1	44.0	343 53.7	07.5	31 28.2	53.9	219 19.8	57.1	248 01.2	142	14 45.6	−130
12	51 25.3	317 05.4	+25 43.9	358 54.3	+19 08.0	46 30.2	+ 0 54.0	234 22.3	+ 3 57.1	262 34.4	142	+14 32.6	−130
13	66 27.8	332 04.7	43.9	13 54.9	08.4	61 32.2	54.2	249 24.8	57.2	277 07.6	142	14 19.6	−132
14	81 30.2	347 04.0	43.9	28 55.6	08.9	76 34.2	54.4	264 27.4	57.2	291 40.8	142	14 06.4	−132
15	96 32.7	2 03.3	43.8	43 56.2	09.4	91 36.2	54.6	279 29.9	57.2	306 14.0	142	13 53.2	−133
16	111 35.1	17 02.6	43.8	58 56.8	09.8	106 38.2	54.8	294 32.4	57.2	320 47.2	143	13 39.9	−133
17	126 37.6	32 02.0	43.8	73 57.5	10.3	121 40.2	55.0	309 34.9	57.2	335 20.5	143	13 26.6	−134
18	141 40.1	47 01.3	+25 43.7	88 58.1	+19 10.7	136 42.2	+ 0 55.2	324 37.5	+ 3 57.2	349 53.8	143	+13 13.2	−135
19	156 42.5	62 00.6	43.7	103 58.7	11.2	151 44.2	55.4	339 40.0	57.3	4 27.1	143	12 59.7	−136
20	171 45.0	76 59.9	43.7	118 59.4	11.6	166 46.2	55.6	354 42.5	57.3	19 00.4	144	12 46.1	−137
21	186 47.5	91 59.2	43.6	134 00.0	12.1	181 48.2	55.8	9 45.0	57.3	33 33.8	143	12 32.4	−137
22	201 49.9	106 58.6	43.6	149 00.6	12.5	196 50.2	56.0	24 47.5	57.3	48 07.1	144	12 18.7	−137
23	216 52.4	121 57.9	43.5	164 01.3	13.0	211 52.2	56.1	39 50.1	57.3	62 40.5	144	12 05.0	−139
0	231 54.9	136 57.2	+25 43.5	179 01.9	+19 13.5	226 54.3	+ 0 56.3	54 52.6	+ 3 57.3	77 13.9	144	+11 51.1	−139
1	246 57.3	151 56.5	43.4	194 02.5	13.9	241 56.3	56.5	69 55.1	57.4	91 47.3	144	11 37.2	−139
2	261 59.8	166 55.8	43.4	209 03.2	14.4	256 58.3	56.7	84 57.6	57.4	106 20.7	145	11 23.3	−141
3	277 02.3	181 55.2	43.4	224 03.8	14.8	272 00.3	56.9	100 00.2	57.4	120 54.2	144	11 09.2	−141
4	292 04.7	196 54.5	43.3	239 04.4	15.3	287 02.3	57.1	115 02.7	57.4	135 27.6	145	10 55.1	−141
5	307 07.2	211 53.8	43.3	254 05.1	15.7	302 04.3	57.3	130 05.2	57.4	150 01.1	145	10 41.0	−143
6	322 09.6	226 53.1	+25 43.2	269 05.7	+19 16.2	317 06.3	+ 0 57.5	145 07.7	+ 3 57.4	164 34.6	144	+10 26.7	−143
7	337 12.1	241 52.5	43.2	284 06.3	16.6	332 08.3	57.7	160 10.2	57.4	179 08.0	145	10 12.4	−143
8	352 14.6	256 51.8	43.1	299 07.0	17.1	347 10.3	57.9	175 12.8	57.5	193 41.5	145	9 58.1	−144
9	7 17.0	271 51.1	43.1	314 07.6	17.5	2 12.3	58.0	190 15.3	57.5	208 15.0	145	9 43.7	−145
10	22 19.5	286 50.4	43.0	329 08.2	18.0	17 14.3	58.2	205 17.8	57.5	222 48.5	145	9 29.2	−145
11	37 22.0	301 49.8	42.9	344 08.8	18.4	32 16.3	58.4	220 20.3	57.5	237 22.0	145	9 14.7	−146
12	52 24.4	316 49.1	+25 42.9	359 09.5	+19 18.9	47 18.3	+ 0 58.6	235 22.8	+ 3 57.5	251 55.5	145	+ 9 00.1	−146
13	67 26.9	331 48.4	42.8	14 10.1	19.3	62 20.3	58.8	250 25.4	57.5	266 29.0	145	8 45.5	−147
14	82 29.4	346 47.7	42.8	29 10.7	19.8	77 22.3	59.0	265 27.9	57.6	281 02.5	145	8 30.8	−147
15	97 31.8	1 47.1	42.7	44 11.4	20.2	92 24.4	59.2	280 30.4	57.6	295 36.0	145	8 16.1	−148
16	112 34.3	16 46.4	42.7	59 12.0	20.7	107 26.4	59.4	295 32.9	57.6	310 09.5	145	8 01.3	−149
17	127 36.8	31 45.7	42.6	74 12.6	21.1	122 28.4	59.6	310 35.4	57.6	324 43.0	145	7 46.4	−149
18	142 39.2	46 45.0	+25 42.5	89 13.3	+19 21.6	137 30.4	+ 0 59.8	325 38.0	+ 3 57.6	339 16.5	145	+ 7 31.5	−150
19	157 41.7	61 44.4	42.5	104 13.9	22.0	152 32.4	0 59.9	340 40.5	57.6	353 50.0	145	7 16.5	−150
20	172 44.1	76 43.7	42.4	119 14.5	22.5	167 34.4	1 00.1	355 43.0	57.6	8 23.5	144	7 01.5	−150
21	187 46.6	91 43.0	42.3	134 15.2	22.9	182 36.4	00.3	10 45.5	57.7	22 56.9	145	6 46.5	−151
22	202 49.1	106 42.3	42.3	149 15.8	23.4	197 38.4	00.5	25 48.0	57.7	37 30.4	144	6 31.4	−152
23	217 51.5	121 41.7	42.2	164 16.4	23.8	212 40.4	00.7	40 50.6	57.7	52 03.8	145	6 16.2	−152
24	232 54.0	136 41.0	+25 42.1	179 17.0	+19 24.3	227 42.4	+ 1 00.9	55 53.1	+ 3 57.7	66 37.3	144	+ 6 01.0	−152
code	—	− 7	0	+ 6	+ 4	+ 20	+ 2	+ 25	+ 1				

G C T	SUN GHA	SUN Dec.
h	° ′	° ′
0	180 55.8	+18 07.7
1	195 55.8	08.4
2	210 55.8	09.0
3	225 55.8	·· 09.6
4	240 55.9	10.3
5	255 55.9	10.9
6	270 55.9	+18 11.5
7	285 55.9	12.1
8	300 55.9	12.8
9	315 55.9	·· 13.4
10	330 55.9	14.0
11	345 55.9	14.6
12	0 55.9	+18 15.3
13	15 55.9	15.9
14	30 56.0	16.5
15	45 56.0	·· 17.1
16	60 56.0	17.7
17	75 56.0	18.4
18	90 56.0	+18 19.0
19	105 56.0	19.6
20	120 56.0	20.2
21	135 56.0	·· 20.8
22	150 56.0	21.5
23	165 56.0	22.1
0	180 56.0	+18 22.7
1	195 56.0	23.3
2	210 56.0	23.9
3	225 56.1	·· 24.6
4	240 56.1	25.2
5	255 56.1	25.8
6	270 56.1	+18 26.4
7	285 56.1	27.0
8	300 56.1	27.6
9	315 56.1	·· 28.2
10	330 56.1	28.8
11	345 56.1	29.5
12	0 56.1	+18 30.1
13	15 56.1	30.7
14	30 56.1	31.3
15	45 56.1	·· 31.9
16	60 56.1	32.5
17	75 56.1	33.1
18	90 56.1	+18 33.7
19	105 56.1	34.3
20	120 56.1	34.9
21	135 56.1	·· 35.5
22	150 56.1	36.1
23	165 56.1	36.7
0	180 56.1	+18 37.4
1	195 56.1	38.0
2	210 56.1	38.6
3	225 56.1	·· 39.2
4	240 56.1	39.8
5	255 56.1	40.4
6	270 56.1	+18 41.0
7	285 56.1	41.6
8	300 56.1	42.2
9	315 56.1	·· 42.8
10	330 56.1	43.4
11	345 56.1	44.0
12	0 56.1	+18 44.6
13	15 56.1	45.2
14	30 56.1	45.8
15	45 56.1	·· 46.4
16	60 56.1	46.9
17	75 56.1	47.5
18	90 56.1	+18 48.1
19	105 56.1	48.7
20	120 56.1	49.3
21	135 56.1	·· 49.9
22	150 56.1	50.5
23	165 56.1	51.1
24	180 56.1	+18 51.7
code	—	+ 6

STARS No.	SHA	Dec.	Transit Mer. Gr.
	° ′	° ′	h m
1	358 32.2	+28 49.1	8 41
2	358 22.0	+58 52.7	8 41
3	349 42.9	−18 15.2	9 16
4	339 21.5	+59 58.9	9 57
5	336 01.7	−57 28.8	10 10
6	332 58.8	+89 02.1	10 23
7	328 53.9	+23 14.0	10 39
8	315 54.1	−40 29.8	11 31
9	309 48.0	+49 41.4	11 55
10	291 43.4	+16 24.9	13 07
11	281 57.3	− 8 15.3	13 46
12	281 44.0	+45 57.2	13 47
13	279 22.4	+ 6 18.5	13 56
14	279 12.1	+28 34.2	13 57
15	276 34.1	− 1 13.8	14 08
16	271 52.2	+ 7 24.1	14 26
17	264 17.3	−52 40.2	14 57
18	259 15.1	−16 38.9	15 17
19	255 49.5	−28 54.3	15 30
20	245 48.8	+ 5 21.1	16 10
21	244 25.0	+28 08.9	16 16
22	234 37.6	−59 21.3	16 55
23	223 27.1	−43 14.3	17 40
24	221 50.3	−69 31.2	17 46
25	218 42.0	− 8 26.9	17 59
26	208 33.1	+12 12.4	18 39
27	194 48.3	+62 01.1	19 34
28	183 21.0	+14 50.6	20 20
29	174 01.5	−62 50.1	20 57
30	172 53.0	−56 50.7	21 01
31	168 46.8	−59 25.7	21 18
32	167 00.9	+56 13.5	21 25
33	159 29.7	+55 10.8	21 55
34	159 20.3	−10 54.7	21 55
35	153 35.0	+49 33.3	22 18
36	149 02.5	−36 08.1	22 36
37	146 38.0	+19 26.0	22 46
38	140 55.3	−60 38.5	23 09
39	137 16.1	+74 21.2	23 23
40	126 50.1	+26 52.4	0 09
41	120 37.8	−22 29.3	0 34
42	113 23.3	−26 19.7	1 03
43	109 06.7	−68 56.6	1 20
44	103 05.8	−15 40.2	1 44
45	97 25.0	−37 04.3	2 06
46	96 49.5	+12 35.4	2 09
47	91 07.4	+51 29.3	2 31
48	84 45.5	−34 24.7	2 57
49	81 10.3	+38 43.9	3 11
50	76 55.9	−26 21.6	3 28
51	62 53.7	+ 8 44.1	4 24
52	54 32.4	−56 53.5	4 57
53	50 03.3	+45 06.0	5 15
54	34 33.0	+ 9 38.9	6 17
55	28 42.2	−47 11.7	6 40
56	16 15.5	−29 52.8	7 30
57	14 25.1	+14 56.4	7 37

Lat.	Sunrise	Twlt. begins	Moonrise 13	14	15	16
N °	h m	h m	h m	h m	h m	h m
70	1 01	////	▭	9 15	11 28	13 31
68	1 57	////	7 17	9 40	11 40	13 34
66	2 29	////	7 59	10 00	11 49	13 37
64	2 53	////	8 28	10 15	11 57	13 39
62	3 11	////	8 49	10 28	12 04	13 40
60	3 27	////	9 07	10 39	12 10	13 42
58	3 39	////	9 21	10 48	12 15	13 43
56	3 50	////	9 33	10 57	12 20	13 44
54	4 00	////	9 44	11 04	12 24	13 45
52	4 09	1 06	9 54	11 10	12 28	13 46
50	4 17	1 39	10 02	11 16	12 31	13 47
45	4 33	2 27	10 20	11 29	12 38	13 49
40	4 46	2 57	10 34	11 39	12 44	13 51
35	4 58	3 21	10 47	11 48	12 49	13 52
30	5 08	3 38	10 57	11 56	12 54	13 53
20	5 25	4 05	11 16	12 09	13 02	13 55
10	5 39	4 24	11 31	12 20	13 09	13 57
0	5 53	4 40	11 46	12 31	13 15	13 59
10	6 06	4 53	12 01	12 42	13 21	14 01
20	6 20	5 04	12 17	12 53	13 28	14 03
30	6 37	5 14	12 34	13 06	13 36	14 05
35	6 46	5 18	12 45	13 14	13 40	14 06
40	6 57	5 22	12 56	13 22	13 45	14 07
45	7 09	5 26	13 10	13 32	13 51	14 09
50	7 24	5 30	13 27	13 44	13 58	14 11
52	7 31	5 32	13 35	13 49	14 01	14 12
54	7 39	5 34	13 44	13 55	14 04	14 13
56	7 48	5 35	13 53	14 02	14 08	14 14
58	7 58	5 36	14 05	14 09	14 12	14 15
60	8 09	5 38	14 17	14 18	14 17	14 16
S						

Lat.	Sunset	Twlt. ends	Moonset 13	14	15	16
N °	h m	h m	h m	h m	h m	h m
70	23 02	////	▭	3 46	3 06	2 36
68	22 01	////	4 08	3 19	2 52	2 30
66	21 27	////	3 24	2 58	2 40	2 26
64	21 02	////	2 55	2 41	2 31	2 21
62	20 43	////	2 33	2 27	2 23	2 18
60	20 28	////	2 15	2 15	2 15	2 14
58	20 15	////	1 59	2 05	2 09	2 12
56	20 03	////	1 46	1 56	2 03	2 09
54	19 54	////	1 35	1 48	1 58	2 07
52	19 45	22 53	1 25	1 41	1 54	2 05
50	19 37	22 18	1 16	1 34	1 49	2 03
45	19 20	21 28	0 57	1 20	1 40	1 58
40	19 07	20 57	0 41	1 08	1 32	1 55
35	18 55	20 33	0 28	0 58	1 26	1 52
30	18 45	20 15	0 16	0 49	1 20	1 49
20	18 28	19 48	24 34	0 34	1 10	1 44
10	18 14	19 29	24 21	0 21	1 01	1 40
0	18 00	19 13	24 08	0 08	0 52	1 36
10	17 46	18 59	23 55	24 44	0 44	1 32
20	17 32	18 48	23 41	24 34	0 34	1 27
30	17 16	18 39	23 25	24 24	0 24	1 22
35	17 06	18 33	23 16	24 17	0 17	1 19
40	16 56	18 30	23 06	24 10	0 10	1 16
45	16 43	18 25	22 53	24 02	0 02	1 12
50	16 28	18 21	22 37	23 52	25 07	1 07
52	16 21	18 19	22 30	23 47	25 05	1 05
54	16 13	18 18	22 22	23 42	25 03	1 03
56	16 04	18 16	22 13	23 36	25 00	1 00
58	15 54	18 14	22 03	23 30	24 57	0 57
60	15 43	18 13	21 51	23 23	24 54	0 54
S						

G C T	Equation of Time (App.—Mean) 13	14	15
h	m s	m s	m s
0	+ 3 43.2	+ 3 44.1	+ 3 44.5
6	+ 3 43.5	+ 3 44.3	+ 3 44.5
12	+ 3 43.7	+ 3 44.4	+ 3 44.5
18	+ 3 44.0	+ 3 44.5	+ 3 44.4
24	+ 3 44.1	+ 3 44.5	+ 3 44.3

GCT of Transit Meridian of Greenwich DAY	Moon	Venus	Mars	Jupiter	Saturn
	h m	h m	h m	h m	h m
13	17 57	14 51	12 05	8 58	20 25
14	18 42	14 52	12 04	8 54	20 21
15	19 25	14 53	12 03	8 51	20 17
16	20 10	14 54	12 02	8 48	20 13

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb	Venus	Mars
°	′	′	′
0			
	0.2	0.1	0.1
30			
	0.2	0.1	0.0
45			
	0.2	0.1	0.0
60			
	0.2	0.1	0.0
75			
	0.2	0.0	0.0
90			

Moon's Lower Limb
Add

Alt.	13	14	15
°	′	′	′
0			
	13.1	13.9	14.9
4			
	13.1	13.9	14.9
8			
	13.2	13.9	14.9
12			
	13.2	13.9	14.9
16			
	13.2	14.0	14.9
20			
	13.3	14.0	15.0
24			
	13.3	14.0	15.0
28			
	13.4	14.1	15.0
32			
	13.5	14.1	15.0
36			
	13.5	14.2	15.0
40			
	13.6	14.2	15.0
44			
	13.7	14.3	15.1
48			
	13.8	14.4	15.1
52			
	13.9	14.4	15.1
56			
	14.0	14.5	15.1
60			
	14.1	14.6	15.2
64			
	14.3	14.7	15.2
68			
	14.4	14.8	15.2
72			
	14.5	14.8	15.3
76			
	14.6	14.9	15.3
80			
	14.8	15.0	15.3
84			
	14.9	15.1	15.4
88			
	15.0	15.2	15.4
90			

Add to table, back cover

Moon's Upper Limb
Subtract

Alt.	13	14	15
°	′	′	′
0			
	16.9	16.5	15.9
4			
	16.9	16.5	15.9
8			
	16.9	16.5	15.9
12			
	16.9	16.5	15.9
16			
	16.8	16.4	15.9
20			
	16.8	16.4	15.9
24			
	16.7	16.4	15.9
28			
	16.7	16.3	15.8
32			
	16.6	16.3	15.8
36			
	16.5	16.2	15.8
40			
	16.4	16.2	15.8
44			
	16.4	16.1	15.8
48			
	16.3	16.0	15.7
52			
	16.2	16.0	15.7
56			
	16.0	15.9	15.7
60			
	15.9	15.8	15.6
64			
	15.8	15.7	15.6
68			
	15.7	15.6	15.6
72			
	15.6	15.6	15.6
76			
	15.4	15.5	15.5
80			
	15.3	15.4	15.5
84			
	15.2	15.3	15.4
88			
	15.1	15.2	15.4
90			

Subtract from table, back cover

Pentecost (Whit Sunday) 13
First Quarter 14

G C T	♈ GHA	VENUS −3.6 GHA	Dec.	MARS 1.6 GHA	Dec.	JUPITER −1.7 GHA	Dec.	SATURN 1.1 GHA	Dec.	MOON GHA	code	Dec.	code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
0	232 54.0	136 41.0	+25 42.1	179 17.0	+19 24.3	227 42.4	+ 1 00.9	55 53.1	+ 3 57.7	66 37.3	144	+ 6 01.0	−152
1	247 56.5	151 40.3	42.0	194 17.7	24.7	242 44.4	01.1	70 55.6	57.7	81 10.7	144	5 45.8	−153
2	262 58.9	166 39.7	42.0	209 18.3	25.2	257 46.5	01.3	85 58.1	57.7	95 44.1	144	5 30.5	−154
3	278 01.4	181 39.0	·· 41.9	224 18.9	·· 25.6	272 48.5	·· 01.5	101 00.6	·· 57.8	110 17.5	144	· 5 15.1	−154
4	293 03.9	196 38.3	41.8	239 19.6	26.1	287 50.5	01.6	116 03.1	57.8	124 50.9	144	4 59.7	−154
5	308 06.3	211 37.7	41.8	254 20.2	26.5	302 52.5	01.8	131 05.7	57.8	139 24.3	143	4 44.3	−154
6	323 08.8	226 37.0	+25 41.7	269 20.8	+19 27.0	317 54.5	+ 1 02.0	146 08.2	+ 3 57.8	153 57.6	144	+ 4 28.9	−156
7	338 11.2	241 36.3	41.6	284 21.5	27.4	332 56.5	02.2	161 10.7	57.8	168 31.0	143	4 13.3	−155
8	353 13.7	256 35.7	41.5	299 22.1	27.8	347 58.5	02.4	176 13.2	57.8	183 04.3	142	3 57.8	−156
9	8 16.2	271 35.0	·· 41.4	314 22.7	·· 28.3	3 00.5	·· 02.6	191 15.7	·· 57.8	197 37.5	143	· 3 42.2	−156
10	23 18.6	286 34.3	41.4	329 23.3	28.7	18 02.5	02.8	206 18.2	57.8	212 10.8	142	3 26.6	−157
11	38 21.1	301 33.7	41.3	344 24.0	29.2	33 04.5	03.0	221 20.8	57.9	226 44.0	142	3 10.9	−157
12	53 23.6	316 33.0	+25 41.2	359 24.6	+19 29.6	48 06.5	+ 1 03.1	236 23.3	+ 3 57.9	241 17.2	142	+ 2 55.2	−157
13	68 26.0	331 32.3	41.1	14 25.2	30.1	63 08.6	03.3	251 25.8	57.9	255 50.4	142	2 39.5	−158
14	83 28.5	346 31.7	41.0	29 25.9	30.5	78 10.6	03.5	266 28.3	57.9	270 23.6	141	2 23.7	−158
15	98 31.0	1 31.0	·· 40.9	44 26.5	·· 30.9	93 12.6	·· 03.7	281 30.8	·· 57.9	284 56.7	141	· 2 07.9	−158
16	113 33.4	16 30.3	40.8	59 27.1	31.4	108 14.6	03.9	296 33.3	57.9	299 29.8	140	1 52.1	−158
17	128 35.9	31 29.7	40.7	74 27.7	31.8	123 16.6	04.1	311 35.9	57.9	314 02.8	141	1 36.3	−159
18	143 38.4	46 29.0	+25 40.7	89 28.4	+19 32.3	138 18.6	+ 1 04.3	326 38.4	+ 3 58.0	328 35.9	139	+ 1 20.4	−159
19	158 40.8	61 28.3	40.6	104 29.0	32.7	153 20.6	04.5	341 40.9	58.0	343 08.8	140	1 04.5	−160
20	173 43.3	76 27.7	40.5	119 29.6	33.2	168 22.6	04.6	356 43.4	58.0	357 41.8	139	0 48.5	−160
21	188 45.7	91 27.0	·· 40.4	134 30.3	·· 33.6	183 24.7	·· 04.8	11 45.9	·· 58.0	12 14.7	139	· 0 32.5	−160
22	203 48.2	106 26.3	40.3	149 30.9	34.0	198 26.7	05.0	26 48.4	58.0	26 47.6	138	0 16.5	−160
23	218 50.7	121 25.7	40.2	164 31.5	34.5	213 28.7	05.2	41 50.9	58.0	41 20.4	138	+ 0 00.5	−160
0	233 53.1	136 25.0	+25 40.1	179 32.2	+19 34.9	228 30.7	+ 1 05.4	56 53.5	+ 3 58.0	55 53.2	137	− 0 15.5	−161
1	248 55.6	151 24.4	40.0	194 32.8	35.3	243 32.7	05.6	71 56.0	58.1	70 25.9	137	0 31.6	−161
2	263 58.1	166 23.7	39.9	209 33.4	35.8	258 34.7	05.8	86 58.5	58.1	84 58.6	137	0 47.7	−161
3	279 00.5	181 23.0	·· 39.8	224 34.0	·· 36.2	273 36.7	·· 06.0	102 01.0	·· 58.1	99 31.3	136	· 1 03.8	−161
4	294 03.0	196 22.4	39.7	239 34.7	36.7	288 38.7	06.1	117 03.5	58.1	114 03.9	135	1 19.9	−161
5	309 05.5	211 21.7	39.6	254 35.3	37.1	303 40.8	06.3	132 06.0	58.1	128 36.4	135	1 36.0	−162
6	324 07.9	226 21.1	+25 39.5	269 35.9	+19 37.5	318 42.8	+ 1 06.5	147 08.5	+ 3 58.1	143 08.9	135	− 1 52.2	−162
7	339 10.4	241 20.4	39.4	284 36.5	38.0	333 44.8	06.7	162 11.1	58.1	157 41.4	133	2 08.4	−161
8	354 12.9	256 19.7	39.3	299 37.2	38.4	348 46.8	06.9	177 13.6	58.1	172 13.7	134	2 24.5	−162
9	9 15.3	271 19.1	·· 39.1	314 37.8	·· 38.8	3 48.8	·· 07.1	192 16.1	·· 58.2	186 46.1	133	· 2 40.7	−162
10	24 17.8	286 18.4	39.0	329 38.4	39.3	18 50.8	07.3	207 18.6	58.2	201 18.4	132	2 56.9	−163
11	39 20.2	301 17.8	38.9	344 39.1	39.7	33 52.8	07.5	222 21.1	58.2	215 50.6	131	3 13.2	−162
12	54 22.7	316 17.1	+25 38.8	359 39.7	+19 40.2	48 54.8	+ 1 07.6	237 23.6	+ 3 58.2	230 22.7	131	− 3 29.4	−162
13	69 25.2	331 16.4	38.7	14 40.3	40.6	63 56.9	07.8	252 26.1	58.2	244 54.8	131	3 45.6	−162
14	84 27.6	346 15.8	38.6	29 40.9	41.0	78 58.9	08.0	267 28.6	58.2	259 26.9	130	4 01.8	−163
15	99 30.1	1 15.1	·· 38.5	44 41.6	·· 41.5	94 00.9	·· 08.2	282 31.2	·· 58.2	273 58.9	129	· 4 18.1	−162
16	114 32.6	16 14.5	38.3	59 42.2	41.9	109 02.9	08.4	297 33.7	58.2	288 30.8	128	4 34.3	−163
17	129 35.0	31 13.8	38.2	74 42.8	42.3	124 04.9	08.6	312 36.2	58.2	303 02.6	128	4 50.6	−162
18	144 37.5	46 13.2	+25 38.1	89 43.4	+19 42.8	139 06.9	+ 1 08.8	327 38.7	+ 3 58.3	317 34.4	127	− 5 06.8	−163
19	159 40.0	61 12.5	38.0	104 44.1	43.2	154 08.9	08.9	342 41.2	58.3	332 06.1	126	5 23.1	−162
20	174 42.4	76 11.9	37.9	119 44.7	43.6	169 11.0	09.1	357 43.7	58.3	346 37.7	126	5 39.3	−162
21	189 44.9	91 11.2	·· 37.7	134 45.3	·· 44.1	184 13.0	·· 09.3	12 46.2	·· 58.3	1 09.3	124	· 5 55.5	−163
22	204 47.3	106 10.6	37.6	149 46.0	44.5	199 15.0	09.5	27 48.7	58.3	15 40.7	125	6 11.8	−162
23	219 49.8	121 09.9	37.5	164 46.6	44.9	214 17.0	09.7	42 51.2	58.3	30 12.2	123	6 28.0	−162
0	234 52.3	136 09.3	+25 37.4	179 47.2	+19 45.3	229 19.0	+ 1 09.9	57 53.8	+ 3 58.3	44 43.5	122	− 6 44.2	−162
1	249 54.7	151 08.6	37.2	194 47.8	45.8	244 21.0	10.1	72 56.3	58.3	59 14.7	122	7 00.4	−162
2	264 57.2	166 08.0	37.1	209 48.5	46.2	259 23.1	10.2	87 58.8	58.3	73 45.9	121	7 16.6	−162
3	279 59.7	181 07.3	·· 37.0	224 49.1	·· 46.6	274 25.1	·· 10.4	103 01.3	·· 58.4	88 17.0	120	· 7 32.8	−161
4	295 02.1	196 06.7	36.9	239 49.7	47.1	289 27.1	10.6	118 03.8	58.4	102 48.0	119	7 48.9	−162
5	310 04.6	211 06.0	36.7	254 50.3	47.5	304 29.1	10.8	133 06.3	58.4	117 18.9	119	8 05.1	−161
6	325 07.1	226 05.4	+25 36.6	269 51.0	+19 47.9	319 31.1	+ 1 11.0	148 08.8	+ 3 58.4	131 49.8	117	− 8 21.2	−161
7	340 09.5	241 04.7	36.5	284 51.6	48.4	334 33.1	11.2	163 11.3	58.4	146 20.5	117	8 37.3	−161
8	355 12.0	256 04.1	36.3	299 52.2	48.8	349 35.2	11.4	178 13.8	58.4	160 51.2	116	8 53.4	−161
9	10 14.5	271 03.4	·· 36.2	314 52.9	·· 49.2	4 37.2	·· 11.5	193 16.3	·· 58.4	175 21.8	115	· 9 09.5	−160
10	25 16.9	286 02.8	36.0	329 53.5	49.6	19 39.2	11.7	208 18.9	58.4	189 52.3	113	9 25.5	−160
11	40 19.4	301 02.1	35.9	344 54.1	50.1	34 41.2	11.9	223 21.4	58.4	204 22.6	113	9 41.5	−160
12	55 21.8	316 01.5	+25 35.8	359 54.7	+19 50.5	49 43.2	+ 1 12.1	238 23.9	+ 3 58.5	218 52.9	112	− 9 57.5	−159
13	70 24.3	331 00.8	35.6	14 55.4	50.9	64 45.2	12.3	253 26.4	58.5	233 23.1	112	10 13.4	−159
14	85 26.8	346 00.2	35.5	29 56.0	51.4	79 47.3	12.5	268 28.9	58.5	247 53.3	110	10 29.3	−159
15	100 29.2	0 59.5	·· 35.3	44 56.6	·· 51.8	94 49.3	·· 12.6	283 31.4	·· 58.5	262 23.3	109	· 10 45.2	−159
16	115 31.7	15 58.9	35.2	59 57.2	52.2	109 51.3	12.8	298 33.9	58.5	276 53.2	108	11 01.1	−158
17	130 34.2	30 58.2	35.0	74 57.9	52.6	124 53.3	13.0	313 36.4	58.5	291 23.0	107	11 16.9	−157
18	145 36.6	45 57.6	+25 34.9	89 58.5	+19 53.1	139 55.3	+ 1 13.2	328 38.9	+ 3 58.5	305 52.7	106	−11 32.6	−158
19	160 39.1	60 56.9	34.8	104 59.1	53.5	154 57.3	13.4	343 41.4	58.5	320 22.3	105	11 48.4	−157
20	175 41.6	75 56.3	34.6	119 59.7	53.9	169 59.4	13.6	358 43.9	58.5	334 51.8	104	12 04.1	−156
21	190 44.0	90 55.7	·· 34.5	135 00.4	·· 54.3	185 01.4	·· 13.8	13 46.4	·· 58.5	349 21.2	102	· 12 19.7	−156
22	205 46.5	105 55.0	34.3	150 01.0	54.7	200 03.4	13.9	28 49.0	58.6	3 50.4	102	12 35.3	−155
23	220 49.0	120 54.4	34.1	165 01.6	55.2	215 05.4	14.1	43 51.5	58.6	18 19.6	101	12 50.8	−155
24	235 51.4	135 53.7	+25 34.0	180 02.2	+19 55.6	230 07.4	+ 1 14.3	58 54.0	+ 3 58.6	32 48.7	99	−13 06.3	−155
code	—	− 7	− 1	+ 6	+ 4	+ 21	+ 2	+ 25	0				

SUN

GCT h	GHA ° ′	Dec. ° ′
0	180 56.1	+18 51.7
1	195 56.1	52.3
2	210 56.1	52.9
3	225 56.1	•• 53.5
4	240 56.1	54.0
5	255 56.1	54.6
6	270 56.0	+18 55.2
7	285 56.0	55.8
8	300 56.0	56.4
9	315 56.0	•• 57.0
10	330 56.0	57.6
11	345 56.0	58.2
12	0 56.0	+18 58.7
13	15 56.0	59.3
14	30 56.0	18 59.9
15	45 56.0	•19 00.5
16	60 56.0	01.1
17	75 56.0	01.7
18	90 56.0	+19 02.2
19	105 55.9	02.8
20	120 55.9	03.4
21	135 55.9	•• 04.0
22	150 55.9	04.5
23	165 55.9	05.1
0	180 55.9	+19 05.7
1	195 55.9	06.3
2	210 55.9	06.9
3	225 55.9	•• 07.4
4	240 55.9	08.0
5	255 55.8	08.6
6	270 55.8	+19 09.2
7	285 55.8	09.7
8	300 55.8	10.3
9	315 55.8	•• 10.9
10	330 55.8	11.4
11	345 55.8	12.0
12	0 55.8	+19 12.6
13	15 55.7	13.2
14	30 55.7	13.7
15	45 55.7	•• 14.3
16	60 55.7	14.9
17	75 55.7	15.4
18	90 55.7	+19 16.0
19	105 55.7	16.6
20	120 55.6	17.1
21	135 55.6	•• 17.7
22	150 55.6	18.3
23	165 55.6	18.8
0	180 55.6	+19 19.4
1	195 55.6	20.0
2	210 55.5	20.5
3	225 55.5	•• 21.1
4	240 55.5	21.6
5	255 55.5	22.2
6	270 55.5	+19 22.8
7	285 55.5	23.3
8	300 55.4	23.9
9	315 55.4	•• 24.4
10	330 55.4	25.0
11	345 55.4	25.6
12	0 55.4	+19 26.1
13	15 55.3	26.7
14	30 55.3	27.2
15	45 55.3	•• 27.8
16	60 55.3	28.3
17	75 55.3	28.9
18	90 55.2	+19 29.5
19	105 55.2	30.0
20	120 55.2	30.6
21	135 55.2	•• 31.1
22	150 55.2	31.7
23	165 55.1	32.2
24	180 55.1	+19 32.8
code	−	+ 6

STARS

No.	SHA ° ′	Dec. ° ′	Transit Mer. Gr. h m
1	358 32.2	+28 49.1	8 29
2	358 22.0	+58 52.6	8 30
3	349 42.9	−18 15.1	9 04
4	339 21.5	+59 58.9	9 45
5	336 01.7	−57 28.8	9 59
6	332 58.2	+89 02.0	10 11
7	328 53.9	+23 14.0	10 27
8	315 54.1	−40 29.8	11 19
9	309 48.0	+49 41.4	11 43
10	291 43.4	+16 24.9	12 55
11	281 57.3	− 8 15.3	13 34
12	281 44.0	+45 57.2	13 35
13	279 22.4	+ 6 18.5	13 45
14	279 12.1	+28 34.2	13 45
15	276 34.1	− 1 13.8	13 56
16	271 52.2	+ 7 24.1	14 15
17	264 17.4	−52 40.2	14 45
18	259 15.2	−16 38.9	15 05
19	255 49.5	−28 54.3	15 19
20	245 48.8	+ 5 21.1	15 59
21	244 25.0	+28 08.9	16 04
22	234 37.6	−59 21.3	16 43
23	223 27.1	−43 14.3	17 28
24	221 50.3	−69 31.2	17 34
25	218 42.1	− 8 26.9	17 47
26	208 33.1	+12 12.4	18 27
27	194 48.3	+62 01.1	19 22
28	183 21.1	+14 50.6	20 08
29	174 01.6	−62 50.1	20 45
30	172 53.0	−56 50.8	20 50
31	168 46.8	−59 25.7	21 06
32	167 00.9	+56 13.5	21 13
33	159 29.8	+55 10.8	21 43
34	159 20.3	−10 54.7	21 44
35	153 35.0	+49 33.3	22 06
36	149 02.5	−36 08.1	22 25
37	146 38.0	+19 26.0	22 34
38	140 55.3	−60 38.5	22 57
39	137 16.1	+74 21.2	23 12
40	126 50.1	+26 52.5	23 53
41	120 37.8	−22 29.3	0 22
42	113 23.3	−26 19.7	0 51
43	109 06.7	−68 56.6	1 08
44	103 05.8	−15 40.2	1 32
45	97 25.0	−37 04.3	1 54
46	96 49.5	+12 35.4	1 57
47	91 07.4	+51 29.3	2 20
48	84 45.4	−34 24.7	2 45
49	81 10.3	+38 43.9	2 59
50	76 55.9	−26 21.6	3 16
51	62 53.6	+ 8 44.1	4 12
52	54 32.4	−56 53.5	4 46
53	50 03.3	+45 06.0	5 03
54	34 33.0	+ 9 38.9	6 05
55	28 42.2	−47 11.7	6 29
56	16 15.4	−29 52.7	7 18
57	14 25.0	+14 56.4	7 26

Lat. °	Sunrise h m	Twlt. begins h m	Moonrise 16 h m	17 h m	18 h m	19 h m
N 70	▭	▭	13 31	15 37	17 55	20 59
68	1 40	////	13 34	15 31	17 38	20 11
66	2 17	////	13 37	15 26	17 25	19 40
64	2 43	////	13 39	15 23	17 14	19 18
62	3 03	////	13 40	15 19	17 04	19 00
60	3 19	////	13 42	15 16	16 56	18 45
58	3 33	////	13 43	15 14	16 50	18 33
56	3 45	////	13 44	15 12	16 43	18 22
54	3 55	////	13 45	15 09	16 38	18 13
52	4 04	0 49	13 46	15 08	16 33	18 04
50	4 12	1 29	13 47	15 06	16 29	17 57
45	4 30	2 21	13 49	15 02	16 19	17 41
40	4 44	2 54	13 51	14 59	16 11	17 28
35	4 56	3 17	13 52	14 57	16 05	17 17
30	5 06	3 35	13 53	14 55	15 59	17 08
20	5 23	4 04	13 55	14 51	15 49	16 52
10	5 39	4 24	13 57	14 47	15 40	16 38
0	5 53	4 40	13 59	14 44	15 32	16 24
10	6 07	4 54	14 01	14 41	15 24	16 12
20	6 22	5 05	14 03	14 38	15 16	15 58
30	6 39	5 15	14 05	14 34	15 06	15 42
35	6 48	5 20	14 06	14 32	15 01	15 33
40	6 59	5 25	14 07	14 30	14 55	15 23
45	7 13	5 29	14 09	14 27	14 47	15 11
50	7 29	5 34	14 11	14 24	14 39	14 57
52	7 36	5 35	14 12	14 23	14 35	14 51
54	7 44	5 37	14 13	14 21	14 31	14 43
56	7 54	5 39	14 14	14 19	14 26	14 35
58	8 04	5 41	14 15	14 18	14 21	14 26
60	8 16	5 43	14 16	14 15	14 15	14 16
S						

Lat. °	Sunset h m	Twlt. ends h m	Moonset 16 h m	17 h m	18 h m	19 h m
N 70	▭	▭	2 36	2 10	1 41	{1 05 / 23 53
68	22 18	////	2 30	2 11	1 50	1 24
66	21 39	////	2 26	2 12	1 57	1 40
64	21 12	////	2 21	2 12	2 03	1 52
62	20 52	////	2 18	2 13	2 08	2 03
60	20 35	////	2 14	2 14	2 13	2 12
58	20 21	////	2 12	2 14	2 17	2 20
56	20 09	////	2 09	2 15	2 20	2 28
54	19 59	////	2 07	2 15	2 24	2 34
52	19 49	23 12	2 05	2 15	2 27	2 40
50	19 41	22 28	2 03	2 16	2 29	2 45
45	19 24	21 34	1 58	2 16	2 35	2 57
40	19 10	21 02	1 55	2 17	2 40	3 06
35	18 58	20 37	1 52	2 18	2 45	3 15
30	18 47	20 18	1 49	2 18	2 48	3 22
20	18 29	19 50	1 44	2 19	2 55	3 35
10	18 14	19 29	1 40	2 20	3 01	3 46
0	18 00	19 13	1 36	2 20	3 06	3 56
10	17 46	18 59	1 32	2 21	3 12	4 07
20	17 31	18 48	1 27	2 21	3 18	4 18
30	17 14	18 37	1 22	2 22	3 25	4 31
35	17 04	18 32	1 19	2 23	3 29	4 39
40	16 53	18 27	1 16	2 23	3 33	4 47
45	16 40	18 23	1 12	2 24	3 38	4 58
50	16 24	18 18	1 07	2 24	3 45	5 10
52	16 16	18 15	1 05	2 25	3 48	5 16
54	16 08	18 14	1 03	2 25	3 51	5 22
56	15 59	18 12	1 00	2 25	3 54	5 29
58	15 48	18 09	0 57	2 26	3 58	5 37
60	15 36	18 07	0 54	2 26	4 03	5 47
S						

ADDITIONAL ALTITUDE CORRECTIONS

Alt. °	Sun's Low'r Limb ′	Venus ′	Mars ′
0			
	0.1	0.1	0.1
30			
	0.1	0.1	0.0
45			
	0.1	0.1	0.0
60			
	0.1	0.1	0.0
75			
	0.1	0.0	0.0
90			

Moon's Lower Limb
Add

Alt. °	16 ′	17 ′	18 ′
0			
	16.1	17.3	18.5
4			
	16.1	17.3	18.5
8			
	16.1	17.3	18.4
12			
	16.0	17.3	18.4
16			
	16.0	17.3	18.4
20			
	16.0	17.2	18.3
24			
	16.0	17.2	18.2
28			
	16.0	17.1	18.2
32			
	16.0	17.1	18.1
36			
	16.0	17.0	18.0
40			
	16.0	17.0	17.9
44			
	15.9	16.9	17.8
48			
	15.9	16.8	17.7
52			
	15.9	16.8	17.5
56			
	15.9	16.7	17.4
60			
	15.8	16.6	17.3
64			
	15.8	16.5	17.1
68			
	15.8	16.4	17.0
72			
	15.8	16.3	16.8
76			
	15.7	16.2	16.7
80			
	15.7	16.1	16.5
84			
	15.7	16.0	16.3
88			
	15.7	16.0	16.2
90			

Add to table, back cover

Moon's Upper Limb
Subtract

Alt. °	16 ′	17 ′	18 ′
0			
	15.3	14.5	13.9
4			
	15.3	14.5	13.9
8			
	15.3	14.6	13.9
12			
	15.3	14.6	13.9
16			
	15.3	14.6	14.0
20			
	15.3	14.6	14.0
24			
	15.3	14.7	14.1
28			
	15.3	14.7	14.2
32			
	15.3	14.8	14.3
36			
	15.3	14.8	14.4
40			
	15.4	14.9	14.5
44			
	15.4	15.0	14.6
48			
	15.4	15.0	14.7
52			
	15.4	15.1	14.8
56			
	15.4	15.2	15.0
60			
	15.5	15.3	15.1
64			
	15.5	15.4	15.2
68			
	15.5	15.5	15.4
72			
	15.5	15.5	15.5
76			
	15.6	15.6	15.7
80			
	15.6	15.7	15.9
84			
	15.6	15.8	16.0
88			
	15.7	15.9	16.1
90			

Subtract from table, back cover

Equation of Time (App.—Mean)

GCT h	16 m s	17 m s	18 m s
0	+ 3 44.3	+ 3 43.6	+ 3 42.4
6	+ 3 44.2	+ 3 43.4	+ 3 41.9
12	+ 3 44.0	+ 3 43.1	+ 3 41.5
18	+ 3 43.9	+ 3 42.7	+ 3 41.0
24	+ 3 43.6	+ 3 42.4	+ 3 40.5

GCT of Transit Meridian of Greenwich

DAY	Moon h m	Venus h m	Mars h m	Jupiter h m	Saturn h m
16	20 10	14 54	12 02	8 48	20 13
17	20 55	14 55	12 01	8 45	20 09
18	21 44	14 56	12 00	8 42	20 05
19	22 38	14 57	11 59	8 38	20 01

GCT	♈	VENUS −3.7		MARS 1.6		JUPITER −1.8		SATURN 1.2		MOON			
	GHA	GHA	Dec.	GHA	Dec.	GHA	Dec.	GHA	Dec.	GHA	code	Dec.	code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
0	235 51.4	135 53.7	+25 34.0	180 02.2	+19 55.6	230 07.4	+ 1 14.3	58 54.0	+ 3 58.6	32 48.7	99	−13 06.3	−155
1	250 53.9	150 53.1	33.8	195 02.9	56.0	245 09.5	14.5	73 56.5	58.6	47 17.6	99	13 21.8	−153
2	265 56.3	165 52.5	33.7	210 03.5	56.4	260 11.5	14.7	88 59.0	58.6	61 46.5	97	13 37.1	−154
3	280 58.8	180 51.8	·· 33.5	225 04.1	·· 56.9	275 13.5	·· 14.9	104 01.5	·· 58.6	76 15.2	96	·13 52.5	−152
4	296 01.3	195 51.2	33.4	240 04.7	57.3	290 15.5	15.0	119 04.0	58.6	90 43.8	95	14 07.7	−152
5	311 03.7	210 50.5	33.2	255 05.4	57.7	305 17.5	15.2	134 06.5	58.6	105 12.3	94	14 22.9	−152
6	326 06.2	225 49.9	+25 33.0	270 06.0	+19 58.1	320 19.6	+ 1 15.4	149 09.0	+ 3 58.6	119 40.7	92	−14 38.1	−150
7	341 08.7	240 49.3	32.9	285 06.6	58.5	335 21.6	15.6	164 11.5	58.6	134 08.9	92	14 53.1	−151
8	356 11.1	255 48.6	32.7	300 07.2	59.0	350 23.6	15.8	179 14.0	58.6	148 37.1	90	15 08.2	−149
9	11 13.6	270 48.0	·· 32.6	315 07.9	·· 59.4	5 25.6	·· 16.0	194 16.5	·· 58.7	163 05.1	89	·15 23.1	−149
10	26 16.1	285 47.3	32.4	330 08.5	19 59.8	20 27.6	16.1	209 19.0	58.7	177 33.0	88	15 38.0	−147
11	41 18.5	300 46.7	32.2	345 09.1	20 00.2	35 29.7	16.3	224 21.5	58.7	192 00.8	86	15 52.7	−148
12	56 21.0	315 46.1	+25 32.1	0 09.7	+20 00.6	50 31.7	+ 1 16.5	239 24.0	+ 3 58.7	206 28.4	85	−16 07.5	−146
13	71 23.4	330 45.4	31.9	15 10.4	01.1	65 33.7	16.7	254 26.5	58.7	220 55.9	85	16 22.1	−145
14	86 25.9	345 44.8	31.7	30 11.0	01.5	80 35.7	16.9	269 29.0	58.7	235 23.4	82	16 36.6	−145
15	101 28.4	0 44.2	·· 31.6	45 11.6	·· 01.9	95 37.7	·· 17.1	284 31.6	·· 58.7	249 50.6	82	·16 51.1	−144
16	116 30.8	15 43.5	31.4	60 12.2	02.3	110 39.8	17.2	299 34.1	58.7	264 17.8	80	17 05.5	−143
17	131 33.3	30 42.9	31.2	75 12.9	02.7	125 41.8	17.4	314 36.6	58.7	278 44.8	79	17 19.8	−142
18	146 35.8	45 42.3	+25 31.0	90 13.5	+20 03.2	140 43.8	+ 1 17.6	329 39.1	+ 3 58.7	293 11.7	78	−17 34.0	−141
19	161 38.2	60 41.6	30.9	105 14.1	03.6	155 45.8	17.8	344 41.6	58.7	307 38.5	76	17 48.1	−140
20	176 40.7	75 41.0	30.7	120 14.7	04.0	170 47.8	18.0	359 44.1	58.7	322 05.1	75	18 02.1	−140
21	191 43.2	90 40.4	·· 30.5	135 15.4	·· 04.4	185 49.9	·· 18.2	14 46.6	·· 58.8	336 31.6	74	·18 16.1	−138
22	206 45.6	105 39.7	30.3	150 16.0	04.8	200 51.9	18.3	29 49.1	58.8	350 58.0	72	18 29.9	−137
23	221 48.1	120 39.1	30.1	165 16.6	05.2	215 53.9	18.5	44 51.6	58.8	5 24.2	72	18 43.6	−136
0	236 50.6	135 38.5	+25 30.0	180 17.2	+20 05.7	230 55.9	+ 1 18.7	59 54.1	+ 3 58.8	19 50.4	69	−18 57.2	−135
1	251 53.0	150 37.9	29.8	195 17.8	06.1	245 58.0	18.9	74 56.6	58.8	34 16.3	69	19 10.7	−134
2	266 55.5	165 37.2	29.6	210 18.5	06.5	261 00.0	19.1	89 59.1	58.8	48 42.2	67	19 24.1	−133
3	281 57.9	180 36.6	·· 29.4	225 19.1	·· 06.9	276 02.0	·· 19.3	105 01.6	·· 58.8	63 07.9	66	·19 37.4	−132
4	297 00.4	195 36.0	29.2	240 19.7	07.3	291 04.0	19.4	120 04.1	58.8	77 33.5	64	19 50.6	−131
5	312 02.9	210 35.3	29.0	255 20.3	07.7	306 06.0	19.6	135 06.6	58.8	91 58.9	64	20 03.7	−129
6	327 05.3	225 34.7	+25 28.9	270 21.0	+20 08.1	321 08.1	+ 1 19.8	150 09.1	+ 3 58.8	106 24.3	61	−20 16.6	−128
7	342 07.8	240 34.1	28.7	285 21.6	08.5	336 10.1	20.0	165 11.6	58.8	120 49.4	61	20 29.4	−127
8	357 10.3	255 33.5	28.5	300 22.2	09.0	351 12.1	20.2	180 14.1	58.8	135 14.5	59	20 42.1	−126
9	12 12.7	270 32.8	·· 28.3	315 22.8	·· 09.4	6 14.1	·· 20.3	195 16.6	·· 58.8	149 39.4	58	·20 54.7	−124
10	27 15.2	285 32.2	28.1	330 23.5	09.8	21 16.2	20.5	210 19.1	58.9	164 04.2	56	21 07.1	−123
11	42 17.7	300 31.6	27.9	345 24.1	10.2	36 18.2	20.7	225 21.6	58.9	178 28.8	56	21 19.4	−122
12	57 20.1	315 31.0	+25 27.7	0 24.7	+20 10.6	51 20.2	+ 1 20.9	240 24.1	+ 3 58.9	192 53.4	53	−21 31.6	−121
13	72 22.6	330 30.3	27.5	15 25.3	11.0	66 22.2	21.1	255 26.6	58.9	207 17.7	53	21 43.7	−119
14	87 25.1	345 29.7	27.3	30 25.9	11.4	81 24.3	21.3	270 29.1	58.9	221 42.0	51	21 55.6	−118
15	102 27.5	0 29.1	·· 27.1	45 26.6	·· 11.8	96 26.3	·· 21.4	285 31.6	·· 58.9	236 06.1	50	·22 07.4	−116
16	117 30.0	15 28.5	26.9	60 27.2	12.2	111 28.3	21.6	300 34.1	58.9	250 30.1	48	22 19.0	−115
17	132 32.4	30 27.8	26.7	75 27.8	12.7	126 30.3	21.8	315 36.6	58.9	264 53.9	47	22 30.5	−113
18	147 34.9	45 27.2	+25 26.5	90 28.4	+20 13.1	141 32.4	+ 1 22.0	330 39.1	+ 3 58.9	279 17.6	46	−22 41.8	−112
19	162 37.4	60 26.6	26.3	105 29.1	13.5	156 34.4	22.2	345 41.6	58.9	293 41.2	45	22 53.0	−110
20	177 39.8	75 26.0	26.1	120 29.7	13.9	171 36.4	22.3	0 44.1	58.9	308 04.7	43	23 04.0	−109
21	192 42.3	90 25.4	·· 25.9	135 30.3	·· 14.3	186 38.4	·· 22.5	15 46.6	·· 58.9	322 28.0	42	·23 14.9	−107
22	207 44.8	105 24.7	25.7	150 30.9	14.7	201 40.5	22.7	30 49.1	58.9	336 51.2	41	23 25.6	−106
23	222 47.2	120 24.1	25.5	165 31.5	15.1	216 42.5	22.9	45 51.6	58.9	351 14.3	40	23 36.2	−104
0	237 49.7	135 23.5	+25 25.3	180 32.2	+20 15.5	231 44.5	+ 1 23.1	60 54.1	+ 3 58.9	5 37.3	38	−23 46.6	−102
1	252 52.2	150 22.9	25.1	195 32.8	15.9	246 46.5	23.2	75 56.6	59.0	20 00.1	37	23 56.8	−101
2	267 54.6	165 22.3	24.9	210 33.4	16.3	261 48.6	23.4	90 59.1	59.0	34 22.8	36	24 06.9	− 99
3	282 57.1	180 21.7	·· 24.6	225 34.0	·· 16.7	276 50.6	·· 23.6	106 01.6	·· 59.0	48 45.4	34	·24 16.8	− 98
4	297 59.6	195 21.0	24.4	240 34.7	17.1	291 52.6	23.8	121 04.1	59.0	63 07.8	34	24 26.6	− 95
5	313 02.0	210 20.4	24.2	255 35.3	17.5	306 54.6	24.0	136 06.6	59.0	77 30.2	32	24 36.1	− 94
6	328 04.5	225 19.8	+25 24.0	270 35.9	+20 17.9	321 56.7	+ 1 24.2	151 09.1	+ 3 59.0	91 52.4	31	−24 45.5	− 92
7	343 06.9	240 19.2	23.8	285 36.5	18.4	336 58.7	24.3	166 11.6	59.0	106 14.5	30	24 54.7	− 91
8	358 09.4	255 18.6	23.6	300 37.1	18.8	352 00.7	24.5	181 14.1	59.0	120 36.5	28	25 03.8	− 88
9	13 11.9	270 18.0	·· 23.4	315 37.8	·· 19.2	7 02.7	·· 24.7	196 16.6	·· 59.0	134 58.3	28	·25 12.6	− 87
10	28 14.3	285 17.3	23.1	330 38.4	19.6	22 04.8	24.9	211 19.1	59.0	149 20.1	27	25 21.3	− 85
11	43 16.8	300 16.7	22.9	345 39.0	20.0	37 06.8	25.1	226 21.6	59.0	163 41.8	25	25 29.8	− 83
12	58 19.3	315 16.1	+25 22.7	0 39.6	+20 20.4	52 08.8	+ 1 25.2	241 24.1	+ 3 59.0	178 03.3	24	−25 38.1	− 81
13	73 21.7	330 15.5	22.5	15 40.2	20.8	67 10.9	25.4	256 26.6	59.0	192 24.7	24	25 46.2	− 79
14	88 24.2	345 14.9	22.2	30 40.9	21.2	82 12.9	25.6	271 29.1	59.0	206 46.1	22	25 54.1	− 77
15	103 26.7	0 14.3	·· 22.0	45 41.5	·· 21.6	97 14.9	·· 25.8	286 31.6	·· 59.0	221 07.3	22	·26 01.8	− 76
16	118 29.1	15 13.7	21.8	60 42.1	22.0	112 16.9	26.0	301 34.1	59.0	235 28.5	20	26 09.4	− 73
17	133 31.6	30 13.1	21.6	75 42.7	22.4	127 19.0	26.1	316 36.6	59.0	249 49.5	19	26 16.7	− 72
18	148 34.1	45 12.5	+25 21.3	90 43.3	+20 22.8	142 21.0	+ 1 26.3	331 39.1	+ 3 59.0	264 10.4	19	−26 23.9	− 69
19	163 36.5	60 11.9	21.1	105 44.0	23.2	157 23.0	26.5	346 41.6	59.0	278 31.3	18	26 30.8	− 67
20	178 39.0	75 11.2	20.9	120 44.6	23.6	172 25.1	26.7	1 44.1	59.1	292 52.1	16	26 37.5	− 66
21	193 41.4	90 10.6	·· 20.6	135 45.2	·· 24.0	187 27.1	·· 26.8	16 46.6	·· 59.1	307 12.7	16	·26 44.1	− 63
22	208 43.9	105 10.0	20.4	150 45.8	24.4	202 29.1	27.0	31 49.1	59.1	321 33.3	15	26 50.4	− 62
23	223 46.4	120 09.4	20.2	165 46.4	24.8	217 31.1	27.2	46 51.6	59.1	335 53.8	15	26 56.6	− 59
24	238 48.8	135 08.8	+25 19.9	180 47.1	+20 25.2	232 33.2	+ 1 27.4	61 54.0	+ 3 59.1	350 14.3	13	−27 02.5	− 57
code	—	− 7	− 2	+ 6	+ 4	+ 20	+ 2	+ 25	0				

GCT	SUN GHA	SUN Dec.
h	° ′	° ′
0	180 55.1	+19 32.8
1	195 55.1	33.3
2	210 55.1	33.9
3	225 55.1	•• 34.4
4	240 55.0	35.0
5	255 55.0	35.5
6	270 55.0	+19 36.1
7	285 55.0	36.6
8	300 54.9	37.1
9	315 54.9	•• 37.7
10	330 54.9	38.2
11	345 54.9	38.8
12	0 54.8	+19 39.3
13	15 54.8	39.9
14	30 54.8	40.4
15	45 54.8	•• 40.9
16	60 54.7	41.5
17	75 54.7	42.0
18	90 54.7	+19 42.6
19	105 54.7	43.1
20	120 54.6	43.6
21	135 54.6	•• 44.2
22	150 54.6	44.7
23	165 54.6	45.3
0	180 54.5	+19 45.8
1	195 54.5	46.3
2	210 54.5	46.9
3	225 54.4	•• 47.4
4	240 54.4	47.9
5	255 54.4	48.5
6	270 54.4	+19 49.0
7	285 54.3	49.5
8	300 54.3	50.1
9	315 54.3	•• 50.6
10	330 54.2	51.1
11	345 54.2	51.7
12	0 54.2	+19 52.2
13	15 54.2	52.7
14	30 54.1	53.2
15	45 54.1	•• 53.8
16	60 54.1	54.3
17	75 54.0	54.8
18	90 54.0	+19 55.4
19	105 54.0	55.9
20	120 53.9	56.4
21	135 53.9	•• 56.9
22	150 53.9	57.4
23	165 53.8	58.0
0	180 53.8	+19 58.5
1	195 53.8	59.0
2	210 53.7	19 59.5
3	225 53.7	•20 00.1
4	240 53.7	00.6
5	255 53.6	01.1
6	270 53.6	+20 01.6
7	285 53.6	02.1
8	300 53.5	02.7
9	315 53.5	•• 03.2
10	330 53.5	03.7
11	345 53.4	04.2
12	0 53.4	+20 04.7
13	15 53.4	05.2
14	30 53.3	05.7
15	45 53.3	•• 06.3
16	60 53.2	06.8
17	75 53.2	07.3
18	90 53.2	+20 07.8
19	105 53.1	08.3
20	120 53.1	08.8
21	135 53.1	•• 09.3
22	150 53.0	09.8
23	165 53.0	10.3
24	180 52.9	+20 10.9
code	−	+ 5

STARS No.	SHA	Dec.	Transit Mer. Gr.
	° ′	° ′	h m
1	358 32.2	+28 49.1	8 17
2	358 22.0	+58 52.6	8 18
3	349 42.9	−18 15.1	8 52
4	339 21.5	+59 58.9	9 34
5	336 01.7	−57 28.8	9 47
6	332 57.6	+89 02.0	9 59
7	328 53.9	+23 14.0	10 15
8	315 54.0	−40 29.8	11 07
9	309 48.0	+49 41.4	11 32
10	291 43.4	+16 24.9	12 44
11	281 57.3	− 8 15.3	13 23
12	281 44.0	+45 57.2	13 23
13	279 22.4	+ 6 18.5	13 33
14	279 12.1	+28 34.2	13 34
15	276 34.1	− 1 13.8	13 44
16	271 52.2	+ 7 24.1	14 03
17	264 17.4	−52 40.2	14 33
18	259 15.2	−16 38.9	14 53
19	255 49.5	−28 54.3	15 07
20	245 48.8	+ 5 21.1	15 47
21	244 25.0	+28 08.9	15 52
22	234 37.6	−59 21.3	16 31
23	223 27.1	−43 14.3	17 16
24	221 50.3	−69 31.2	17 22
25	218 42.1	− 8 26.9	17 35
26	208 33.2	+12 12.4	18 15
27	194 48.4	+62 01.1	19 10
28	183 21.1	+14 50.6	19 56
29	174 01.6	−62 50.1	20 33
30	172 53.0	−56 50.8	20 38
31	168 46.8	−59 25.7	20 54
32	167 00.9	+56 13.5	21 01
33	159 29.8	+55 10.8	21 31
34	159 20.3	−10 54.7	21 32
35	153 35.0	+49 33.3	21 55
36	149 02.5	−36 08.1	22 13
37	146 38.0	+19 26.0	22 22
38	140 55.3	−60 38.5	22 45
39	137 16.1	+74 21.2	23 00
40	126 50.1	+26 52.5	23 41
41	120 37.8	−22 29.3	0 10
42	113 23.3	−26 19.7	0 39
43	109 06.6	−68 56.6	0 56
44	103 05.8	−15 40.2	1 20
45	97 25.0	−37 04.3	1 43
46	96 49.5	+12 35.4	1 45
47	91 07.4	+51 29.3	2 08
48	84 45.4	−34 24.7	2 33
49	81 10.3	+38 43.9	2 47
50	76 55.9	−26 21.6	3 04
51	62 53.6	+ 8 44.1	4 00
52	54 32.3	−56 53.5	4 34
53	50 03.3	+45 06.0	4 52
54	34 33.0	+ 9 38.9	5 53
55	28 42.1	−47 11.7	6 17
56	16 15.4	−29 52.7	7 06
57	14 25.0	+14 56.4	7 14

Lat.	Sunrise	Twlt. begins	Moonrise 19	Moonrise 20	Moonrise 21	Moonrise 22
N °	h m	h m	h m	h m	h m	h m
70	▭	▭	20 59	■	■	■
68	1 21	////	20 11	■	■	■
66	2 05	////	19 40	23 03	■	■
64	2 34	////	19 18	21 45	■	■
62	2 55	////	19 00	21 09	23 38	■
60	3 13	////	18 45	20 43	22 45	24 25
58	3 27	////	18 33	20 23	22 14	23 44
56	3 40	////	18 22	20 07	21 50	23 16
54	3 50	////	18 13	19 52	21 31	22 54
52	4 00	0 22	18 04	19 40	21 14	22 36
50	4 08	1 18	17 57	19 29	21 00	22 20
45	4 26	2 15	17 41	19 07	20 32	21 49
40	4 41	2 49	17 28	18 49	20 10	21 25
35	4 53	3 14	17 17	18 34	19 51	21 05
30	5 04	3 33	17 08	18 21	19 36	20 48
20	5 22	4 02	16 52	17 59	19 09	20 19
10	5 38	4 23	16 38	17 40	18 46	19 55
0	5 53	4 40	16 24	17 22	18 25	19 32
10	6 07	4 53	16 12	17 05	18 04	19 09
20	6 23	5 05	15 58	16 46	17 42	18 45
30	6 40	5 17	15 42	16 25	17 16	18 17
35	6 50	5 22	15 33	16 13	17 01	18 00
40	7 02	5 27	15 23	15 58	16 43	17 41
45	7 16	5 31	15 11	15 42	16 23	17 17
50	7 32	5 37	14 57	15 21	15 56	16 47
52	7 40	5 38	14 51	15 12	15 44	16 32
54	7 49	5 41	14 43	15 01	15 29	16 15
56	7 58	5 43	14 35	14 49	15 12	15 54
58	8 09	5 45	14 26	14 35	14 52	15 28
60	8 22	5 48	14 16	14 18	14 27	14 53
S						

Lat.	Sunset	Twlt. ends	Moonset 19	Moonset 20	Moonset 21	Moonset 22
N °	h m	h m	h m	h m	h m	h m
70	▭	▭	{1 05 / 23 53}	■	■	■
68	22 38	////	1 24	0 42	■	■
66	21 51	////	1 40	{1 14 / 23 55}	■	■
64	21 22	////	1 52	1 38	1 14	■
62	21 00	////	2 03	1 57	1 50	1 37
60	20 42	////	2 12	2 13	2 17	2 29
58	20 27	////	2 20	2 27	2 38	3 01
56	20 14	////	2 28	2 38	2 55	3 26
54	20 03	////	2 34	2 48	3 10	3 45
52	19 54	23 53	2 40	2 58	3 23	4 02
50	19 45	22 40	2 45	3 06	3 34	4 16
45	19 27	21 40	2 57	3 23	3 58	4 45
40	19 12	21 05	3 06	3 38	4 17	5 08
35	19 00	20 40	3 15	3 50	4 33	5 27
30	18 49	20 21	3 22	4 01	4 47	5 43
20	18 31	19 52	3 35	4 19	5 11	6 11
10	18 15	19 30	3 46	4 36	5 32	6 34
0	18 00	19 13	3 56	4 51	5 51	6 57
10	17 46	19 00	4 07	5 06	6 11	7 19
20	17 30	18 47	4 18	5 23	6 32	7 43
30	17 12	18 35	4 31	5 42	6 56	8 10
35	17 02	18 30	4 39	5 53	7 10	8 27
40	16 51	18 26	4 47	6 06	7 27	8 46
45	16 37	18 20	4 58	6 21	7 47	9 09
50	16 20	18 14	5 10	6 40	8 12	9 39
52	16 13	18 13	5 16	6 49	8 24	9 54
54	16 04	18 11	5 22	6 59	8 38	10 11
56	15 54	18 08	5 29	7 11	8 55	10 31
58	15 43	18 06	5 37	7 24	9 14	10 57
60	15 30	18 03	5 47	7 39	9 39	11 32
S						

GCT	Equation of Time (App.—Mean) 19	20	21
h	m s	m s	m s
0	+ 3 40.5	+ 3 38.2	+ 3 35.3
6	+ 3 40.0	+ 3 37.5	+ 3 34.5
12	+ 3 39.4	+ 3 36.8	+ 3 33.6
18	+ 3 38.8	+ 3 36.1	+ 3 32.8
24	+ 3 38.2	+ 3 35.3	+ 3 31.8

GCT of Transit Meridian of Greenwich

DAY	Moon	Venus	Mars	Jupiter	Saturn
	h m	h m	h m	h m	h m
19	22 38	14 57	11 59	8 38	20 01
20	23 37	14 58	11 58	8 35	19 57
21	24 41	14 59	11 57	8 32	19 53
22	0 41	15 00	11 56	8 29	19 49

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb	Venus	Mars
°	′	′	′
0			
	0.1	0.1	0.1
30			
	0.1	0.1	0.0
45			
	0.1	0.1	0.0
60			
	0.1	0.1	0.0
75			
	0.1	0.0	0.0
90			

Moon's Lower Limb *Add*

Alt.	19	20	21
°	′	′	′
0			
	19.5	20.3	20.8
4			
	19.5	20.2	20.7
8			
	19.5	20.2	20.7
12			
	19.4	20.1	20.6
16			
	19.3	20.1	20.6
20			
	19.3	20.0	20.5
24			
	19.2	19.9	20.4
28			
	19.1	19.8	20.2
32			
	19.0	19.6	20.1
36			
	18.8	19.5	19.9
40			
	18.7	19.3	19.7
44			
	18.5	19.1	19.5
48			
	18.4	18.9	19.3
52			
	18.2	18.7	19.1
56			
	18.0	18.5	18.8
60			
	17.9	18.3	18.6
64			
	17.7	18.1	18.3
68			
	17.5	17.8	18.1
72			
	17.2	17.6	17.8
76			
	17.0	17.3	17.5
80			
	16.8	17.1	17.2
84			
	16.6	16.8	17.0
88			
	16.4	16.6	16.7
90			

Add to table, back cover

Moon's Upper Limb *Subtract*

Alt.	19	20	21
°	′	′	′
0			
	13.3	12.9	12.6
4			
	13.3	12.9	12.6
8			
	13.3	12.9	12.6
12			
	13.4	13.0	12.7
16			
	13.4	13.0	12.8
20			
	13.5	13.1	12.9
24			
	13.6	13.2	13.0
28			
	13.7	13.4	13.1
32			
	13.8	13.5	13.3
36			
	14.0	13.6	13.4
40			
	14.1	13.8	13.6
44			
	14.2	14.0	13.8
48			
	14.4	14.2	14.0
52			
	14.6	14.4	14.3
56			
	14.8	14.6	14.5
60			
	14.9	14.8	14.7
64			
	15.1	15.1	15.0
68			
	15.3	15.3	15.3
72			
	15.5	15.5	15.5
76			
	15.7	15.8	15.8
80			
	16.0	16.0	16.1
84			
	16.2	16.3	16.4
88			
	16.3	16.5	16.6
90			

Subtract from table, back cover

Trinity Sunday 20
Full Moon 21

GCT	♈ GHA	VENUS −3.7 GHA	VENUS Dec.	MARS 1.6 GHA	MARS Dec.	JUPITER −1.8 GHA	JUPITER Dec.	SATURN 1.2 GHA	SATURN Dec.	MOON GHA	code	MOON Dec.	code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
0	238 48.8	135 08.8	+25 19.9	180 47.1	+20 25.2	232 33.2	+ 1 27.4	61 54.0	+ 3 59.1	350 14.3	13	−27 02.5	− 57
1	253 51.3	150 08.2	19.7	195 47.7	25.6	247 35.2	27.6	76 56.5	59.1	4 34.6	13	27 08.2	− 55
2	268 53.8	165 07.6	19.5	210 48.3	26.0	262 37.2	27.7	91 59.0	59.1	18 54.9	13	27 13.7	− 53
3	283 56.2	180 07.0	·· 19.2	225 48.9	·· 26.4	277 39.3	·· 27.9	107 01.5	·· 59.1	33 15.2	11	·27 19.0	− 51
4	298 58.7	195 06.4	19.0	240 49.5	26.8	292 41.3	28.1	122 04.0	59.1	47 35.3	11	27 24.1	− 48
5	314 01.2	210 05.8	18.8	255 50.2	27.2	307 43.3	28.3	137 06.5	59.1	61 55.4	10	27 28.9	− 47
6	329 03.6	225 05.2	+25 18.5	270 50.8	+20 27.6	322 45.3	+ 1 28.5	152 09.0	+ 3 59.1	76 15.4	10	−27 33.6	− 44
7	344 06.1	240 04.6	18.3	285 51.4	28.0	337 47.4	28.6	167 11.5	59.1	90 35.4	9	27 38.0	− 42
8	359 08.5	255 04.0	18.0	300 52.0	28.4	352 49.4	28.8	182 14.0	59.1	104 55.3	9	27 42.2	− 40
9	14 11.0	270 03.4	·· 17.8	315 52.6	·· 28.8	7 51.4	·· 29.0	197 16.5	·· 59.1	119 15.2	9	·27 46.2	− 38
10	29 13.5	285 02.8	17.5	330 53.3	29.1	22 53.5	29.2	212 19.0	59.1	133 35.1	7	27 50.0	− 36
11	44 15.9	300 02.2	17.3	345 53.9	29.5	37 55.5	29.4	227 21.5	59.1	147 54.8	8	27 53.6	− 33
12	59 18.4	315 01.6	+25 17.0	0 54.5	+20 29.9	52 57.5	+ 1 29.5	242 24.0	+ 3 59.1	162 14.6	7	−27 56.9	− 32
13	74 20.9	330 01.0	16.8	15 55.1	30.3	67 59.6	29.7	257 26.5	59.1	176 34.3	7	28 00.1	− 29
14	89 23.3	345 00.4	16.5	30 55.7	30.7	83 01.6	29.9	272 29.0	59.1	190 54.0	6	28 03.0	− 26
15	104 25.8	359 59.8	·· 16.3	45 56.4	·· 31.1	98 03.6	·· 30.1	287 31.5	·· 59.1	205 13.6	7	·28 05.6	− 25
16	119 28.3	14 59.2	16.0	60 57.0	31.5	113 05.7	30.2	302 34.0	59.1	219 33.3	6	28 08.1	− 22
17	134 30.7	29 58.6	15.8	75 57.6	31.9	128 07.7	30.4	317 36.4	59.1	233 52.9	6	28 10.3	− 20
18	149 33.2	44 58.0	+25 15.5	90 58.2	+20 32.3	143 09.7	+ 1 30.6	332 38.9	+ 3 59.1	248 12.5	6	−28 12.3	− 18
19	164 35.7	59 57.4	15.3	105 58.8	32.7	158 11.7	30.8	347 41.4	59.1	262 32.1	5	28 14.1	− 16
20	179 38.1	74 56.8	15.0	120 59.5	33.1	173 13.8	31.0	2 43.9	59.1	276 51.6	6	28 15.7	− 13
21	194 40.6	89 56.2	·· 14.8	136 00.1	·· 33.5	188 15.8	·· 31.1	17 46.4	·· 59.1	291 11.2	6	·28 17.0	− 11
22	209 43.0	104 55.6	14.5	151 00.7	33.9	203 17.8	31.3	32 48.9	59.1	305 30.8	5	28 18.1	− 9
23	224 45.5	119 55.0	14.2	166 01.3	34.3	218 19.9	31.5	47 51.4	59.1	319 50.3	6	28 19.0	− 7
0	239 48.0	134 54.4	+25 14.0	181 01.9	+20 34.6	233 21.9	+ 1 31.7	62 53.9	+ 3 59.1	334 09 9	6	−28 19.7	− 4
1	254 50.4	149 53.9	13.7	196 02.6	35.0	248 23.9	31.8	77 56.4	59.2	348 29.5	6	28 20.1	− 3
2	269 52.9	164 53.3	13.4	211 03.2	35.4	263 26.0	32.0	92 58.9	59.2	2 49.1	6	28 20.4	0
3	284 55.4	179 52.7	·· 13.2	226 03.8	·· 35.8	278 28.0	·· 32.2	108 01.4	·· 59.2	17 08.7	6	·28 20.4	+ 3
4	299 57.8	194 52.1	12.9	241 04.4	36.2	293 30.0	32.4	123 03.9	59.2	31 28.3	7	28 20.1	+ 4
5	315 00.3	209 51.5	12.6	256 05.0	36.6	308 32.1	32.6	138 06.3	59.2	45 48.0	7	28 19.7	+ 7
6	330 02.8	224 50.9	+25 12.4	271 05.6	+20 37.0	323 34.1	+ 1 32.7	153 08.8	+ 3 59.2	60 07.7	7	−28 19.0	+ 9
7	345 05.2	239 50.3	12.1	286 06.3	37.4	338 36.1	32.9	168 11.3	59.2	74 27.4	7	28 18.1	+ 11
8	0 07.7	254 49.7	11.8	301 06.9	37.8	353 38.2	33.1	183 13.8	59.2	88 47.1	8	28 17.0	+ 14
9	15 10.2	269 49.1	·· 11.6	316 07.5	·· 38.1	8 40.2	·· 33.3	198 16.3	·· 59.2	103 06.9	9	·28 15.6	+ 15
10	30 12.6	284 48.6	11.3	331 08.1	38.5	23 42.2	33.4	213 18.8	59.2	117 26.8	9	28 14.1	+ 18
11	45 15.1	299 48.0	11.0	346 08.7	38.9	38 44.3	33.6	228 21.3	59.2	131 46.7	9	28 12.3	+ 20
12	60 17.5	314 47.4	+25 10.7	1 09.4	+20 39.3	53 46.3	+ 1 33.8	243 23.8	+ 3 59.2	146 06.6	10	−28 10.3	+ 22
13	75 20.0	329 46.8	10.5	16 10.0	39.7	68 48.3	34.0	258 26.3	59.2	160 26.6	10	28 08.1	+ 24
14	90 22.5	344 46.2	10.2	31 10.6	40.1	83 50.4	34.1	273 28.8	59.2	174 46.6	11	28 05.7	+ 27
15	105 24.9	359 45.6	·· 09.9	46 11.2	·· 40.5	98 52.4	·· 34.3	288 31.2	·· 59.2	189 06.7	12	·28 03.0	+ 29
16	120 27.4	14 45.0	09.6	61 11.8	40.9	113 54.5	34.5	303 33.7	59.2	203 26.9	12	28 00.1	+ 30
17	135 29.9	29 44.5	09.4	76 12.4	41.2	128 56.5	34.7	318 36.2	59.2	217 47.1	13	27 57.1	+ 33
18	150 32.3	44 43.9	+25 09.1	91 13.1	+20 41.6	143 58.5	+ 1 34.8	333 38.7	+ 3 59.2	232 07.4	14	−27 53.8	+ 35
19	165 34.8	59 43.3	08.8	106 13.7	42.0	159 00.6	35.0	348 41.2	59.2	246 27.8	14	27 50.3	+ 37
20	180 37.3	74 42.7	08.5	121 14.3	42.4	174 02.6	35.2	3 43.7	59.2	260 48.2	16	27 46.6	+ 40
21	195 39.7	89 42.1	·· 08.2	136 14.9	·· 42.8	189 04.6	·· 35.4	18 46.2	·· 59.2	275 08.8	16	·27 42.6	+ 41
22	210 42.2	104 41.6	07.9	151 15.5	43.2	204 06.7	35.6	33 48.7	59.2	289 29.4	17	27 38.5	+ 43
23	225 44.7	119 41.0	07.6	166 16.1	43.5	219 08.7	35.7	48 51.2	59.2	303 50.1	18	27 34.2	+ 46
0	240 47.1	134 40.4	+25 07.4	181 16.8	+20 43.9	234 10.7	+ 1 35.9	63 53.6	+ 3 59.2	318 10.9	18	−27 29.6	+ 47
1	255 49.6	149 39.8	07.1	196 17.4	44.3	249 12.8	36.1	78 56.1	59.2	332 31.7	20	27 24.9	+ 49
2	270 52.0	164 39.2	06.8	211 18.0	44.7	264 14.8	36.3	93 58.6	59.2	346 52.7	21	27 20.0	+ 52
3	285 54.5	179 38.7	·· 06.5	226 18.6	·· 45.1	279 16.8	·· 36.4	109 01.1	·· 59.2	1 13.8	21	·27 14.8	+ 53
4	300 57.0	194 38.1	06.2	241 19.2	45.4	294 18.9	36.6	124 03.6	59.2	15 34.9	23	27 09.5	+ 56
5	315 59.4	209 37.5	05.9	256 19.8	45.8	309 20.9	36.8	139 06.1	59.2	29 56.2	24	27 03.9	+ 57
6	331 01.9	224 36.9	+25 05.6	271 20.5	+20 46.2	324 23.0	+ 1 37.0	154 08.6	+ 3 59.2	44 17.6	24	−26 58.2	+ 59
7	346 04.4	239 36.4	05.3	286 21.1	46.6	339 25.0	37.1	169 11.0	59.2	58 39.0	26	26 52.3	+ 62
8	1 06.8	254 35.8	05.0	301 21.7	47.0	354 27.0	37.3	184 13.5	59.2	73 00.6	27	26 46.1	+ 63
9	16 09.3	269 35.2	·· 04.7	316 22.3	·· 47.3	9 29.1	·· 37.5	199 16.0	·· 59.2	87 22.3	28	·26 39.8	+ 65
10	31 11.8	284 34.6	04.4	331 22.9	47.7	24 31.1	37.7	214 18.5	59.2	101 44.1	29	26 33.3	+ 66
11	46 14.2	299 34.1	04.1	346 23.5	48.1	39 33.1	37.8	229 21.0	59.2	116 06.0	31	26 26.7	+ 69
12	61 16.7	314 33.5	+25 03.8	1 24.2	+20 48.5	54 35.2	+ 1 38.0	244 23.5	+ 3 59.2	130 28.1	31	−26 19.8	+ 71
13	76 19.1	329 32.9	03.5	16 24.8	48.9	69 37.2	38.2	259 26.0	59.2	144 50.2	33	26 12.7	+ 72
14	91 21.6	344 32.4	03.2	31 25.4	49.2	84 39.3	38.4	274 28.5	59.2	159 12.5	34	26 05.5	+ 74
15	106 24.1	359 31.8	·· 02.9	46 26.0	·· 49.6	99 41.3	·· 38.5	289 30.9	·· 59.2	173 34.9	35	·25 58.1	+ 76
16	121 26.5	14 31.2	02.6	61 26.6	50.0	114 43.3	38.7	304 33.4	59.2	187 57.4	36	25 50.5	+ 77
17	136 29.0	29 30.7	02.3	76 27.2	50.4	129 45.4	38.9	319 35.9	59.2	202 20.0	38	25 42.8	+ 80
18	151 31.5	44 30.1	+25 02.0	91 27.9	+20 50.7	144 47.4	+ 1 39.1	334 38.4	+ 3 59.2	216 42.8	39	−25 34.8	+ 81
19	166 33.9	59 29.5	01.7	106 28.5	51.1	159 49.5	39.2	349 40.9	59.2	231 05.7	40	25 26.7	+ 83
20	181 36.4	74 29.0	01.4	121 29.1	51.5	174 51.5	39.4	4 43.4	59.2	245 28.7	42	25 18.4	+ 84
21	196 38.9	89 28.4	·· 01.1	136 29.7	·· 51.9	189 53.5	·· 39.6	19 45.8	·· 59.2	259 51.9	43	·25 10.0	+ 86
22	211 41.3	104 27.8	00.7	151 30.3	52.2	204 55.6	39.8	34 48.3	59.2	274 15.2	44	25 01.4	+ 88
23	226 43.8	119 27.3	00.4	166 30.9	52.6	219 57.6	39.9	49 50.8	59.2	288 38.6	46	24 52.6	+ 89
24	241 46.3	134 26.7	+25 00.1	181 31.6	+20 53.0	234 59.7	+ 1 40.1	64 53.3	+ 3 59.2	303 02.2	46	−24 43.7	+ 91
code	—	− 6	− 2	+ 6	+ 4	+ 20	+ 2	+ 25	0				

GCT	SUN GHA	SUN Dec.
h	° ′	° ′
0	180 52.9	+20 10.9
1	195 52.9	11.4
2	210 52.9	11.9
3	225 52.8	•• 12.4
4	240 52.8	12.9
5	255 52.7	13.4
6	270 52.7	+20 13.9
7	285 52.7	14.4
8	300 52.6	14.9
9	315 52.6	•• 15.4
10	330 52.5	15.9
11	345 52.5	16.4
12	0 52.5	+20 16.9
13	15 52.4	17.4
14	30 52.4	17.9
15	45 52.3	•• 18.4
16	60 52.3	18.9
17	75 52.2	19.4
18	90 52.2	+20 19.9
19	105 52.2	20.4
20	120 52.1	20.9
21	135 52.1	•• 21.4
22	150 52.0	21.9
23	165 52.0	22.4
0	180 51.9	+20 22.9
1	195 51.9	23.4
2	210 51.9	23.8
3	225 51.8	•• 24.3
4	240 51.8	24.8
5	255 51.7	25.3
6	270 51.7	+20 25.8
7	285 51.6	26.3
8	300 51.6	26.8
9	315 51.5	•• 27.3
10	330 51.5	27.8
11	345 51.4	28.3
12	0 51.4	+20 28.7
13	15 51.3	29.2
14	30 51.3	29.7
15	45 51.3	•• 30.2
16	60 51.2	30.7
17	75 51.2	31.2
18	90 51.1	+20 31.6
19	105 51.1	32.1
20	120 51.0	32.6
21	135 51.0	•• 33.1
22	150 50.9	33.6
23	165 50.9	34.0
0	180 50.8	+20 34.5
1	195 50.8	35.0
2	210 50.7	35.5
3	225 50.7	•• 36.0
4	240 50.6	36.4
5	255 50.6	36.9
6	270 50.5	+20 37.4
7	285 50.5	37.9
8	300 50.4	38.3
9	315 50.4	•• 38.8
10	330 50.3	39.3
11	345 50.3	39.8
12	0 50.2	+20 40.2
13	15 50.1	40.7
14	30 50.1	41.2
15	45 50.0	•• 41.6
16	60 50.0	42.1
17	75 49.9	42.6
18	90 49.9	+20 43.0
19	105 49.8	43.5
20	120 49.8	44.0
21	135 49.7	•• 44.4
22	150 49.7	44.9
23	165 49.6	45.4
24	180 49.6	+20 45.8
code	—	+ 5

STARS No.	SHA	Dec.	Transit Mer. Gr.
	° ′	° ′	h m
1	358 32.2	+28 49.2	8 05
2	358 21.9	+58 52.6	8 06
3	349 42.9	−18 15.1	8 41
4	339 21.4	+59 58.8	9 22
5	336 01.6	−57 28.8	9 35
6	332 57.0	+89 02.0	9 47
7	328 53.9	+23 14.0	10 04
8	315 54.0	−40 29.8	10 55
9	309 47.9	+49 41.4	11 20
10	291 43.4	+16 24.9	12 32
11	281 57.3	− 8 15.3	13 11
12	281 44.0	+45 57.2	13 12
13	279 22.4	+ 6 18.5	13 21
14	279 12.1	+28 34.2	13 22
15	276 34.1	− 1 13.8	13 32
16	271 52.2	+ 7 24.1	13 51
17	264 17.4	−52 40.1	14 21
18	259 15.2	−16 38.8	14 41
19	255 49.6	−28 54.3	14 55
20	245 48.8	+ 5 21.1	15 35
21	244 25.0	+28 08.9	15 41
22	234 37.7	−59 21.3	16 20
23	223 27.1	−43 14.3	17 04
24	221 50.4	−69 31.2	17 11
25	218 42.1	− 8 26.9	17 23
26	208 33.2	+12 12.4	18 04
27	194 48.4	+62 01.1	18 58
28	183 21.1	+14 50.6	19 44
29	174 01.6	−62 50.1	20 21
30	172 53.0	−56 50.8	20 26
31	168 46.8	−59 25.7	20 42
32	167 00.9	+56 13.5	20 49
33	159 29.8	+55 10.8	21 19
34	159 20.3	−10 54.7	21 20
35	153 35.0	+49 33.4	21 43
36	149 02.5	−36 08.2	22 01
37	146 38.0	+19 26.0	22 11
38	140 55.3	−60 38.5	22 33
39	137 16.1	+74 21.2	22 48
40	126 50.1	+26 52.5	23 30
41	120 37.8	−22 29.3	23 54
42	113 23.3	−26 19.7	0 27
43	109 06.6	−68 56.6	0 44
44	103 05.8	−15 40.2	1 08
45	97 25.0	−37 04.3	1 31
46	96 49.5	+12 35.4	1 33
47	91 07.4	+51 29.3	1 56
48	84 45.4	−34 24.7	2 21
49	81 10.3	+38 43.9	2 36
50	76 55.9	−26 21.6	2 53
51	62 53.6	+ 8 44.1	3 49
52	54 32.3	−56 53.5	4 22
53	50 03.3	+45 06.0	4 40
54	34 33.0	+ 9 38.9	5 42
55	28 42.1	−47 11.7	6 05
56	16 15.4	−29 52.7	6 55
57	14 25.0	+14 56.4	7 02

Lat.	Sunrise	Twlt. begins	Moonrise 22	23	24	25
N °	h m	h m	h m	h m	h m	h m
70	□	□	■	■	■	■
68	1 00	////	■	■	■	■
66	1 53	////	■	■	■	■
64	2 24	////	■	■	■	2 31
62	2 48	////	■	■	2 06	1 50
60	3 06	////	24 25	0 25	1 09	1 22
58	3 22	////	23 44	24 36	0 36	1 01
56	3 35	////	23 16	24 12	0 12	0 43
54	3 46	////	22 54	23 52	24 27	0 27
52	3 56	////	22 36	23 35	24 14	0 14
50	4 05	1 05	22 20	23 21	24 02	0 02
45	4 24	2 10	21 49	22 52	23 38	24 12
40	4 39	2 46	21 25	22 29	23 19	23 57
35	4 52	3 11	21 05	22 10	23 02	23 44
30	5 03	3 31	20 48	21 53	22 48	23 33
20	5 22	4 01	20 19	21 25	22 24	23 14
10	5 38	4 22	19 55	21 02	22 03	22 57
0	5 53	4 40	19 32	20 39	21 43	22 41
10	6 08	4 54	19 09	20 17	21 23	22 25
20	6 24	5 07	18 45	19 53	21 02	22 08
30	6 42	5 18	18 17	19 25	20 37	21 48
35	6 53	5 24	18 00	19 09	20 23	21 37
40	7 05	5 29	17 41	18 50	20 06	21 24
45	7 19	5 35	17 17	18 26	19 46	21 08
50	7 36	5 40	16 47	17 56	19 20	20 48
52	7 44	5 42	16 32	17 42	19 08	20 39
54	7 53	5 45	16 15	17 24	18 53	20 28
56	8 04	5 47	15 54	17 04	18 37	20 16
58	8 15	5 49	15 28	16 38	18 17	20 02
60	8 29	5 53	14 53	16 02	17 51	19 46
S						

Lat.	Sunset	Twlt. ends	Moonset 22	23	24	25
N °	h m	h m	h m	h m	h m	h m
70	□	□	■	■	■	■
68	23 02	////	■	■	■	■
66	22 04	////	■	■	■	■
64	21 31	////	■	■	■	5 38
62	21 07	////	1 37	■	3 52	6 17
60	20 48	////	2 29	3 11	4 47	6 45
58	20 33	////	3 01	3 52	5 20	7 06
56	20 20	////	3 26	4 20	5 44	7 23
54	20 08	////	3 45	4 42	6 03	7 38
52	19 58	////	4 02	5 00	6 20	7 50
50	19 49	22 53	4 16	5 16	6 34	8 01
45	19 30	21 46	4 45	5 47	7 02	8 24
40	19 15	21 10	5 08	6 11	7 25	8 43
35	19 02	20 44	5 27	6 31	7 43	8 58
30	18 51	20 24	5 43	6 48	7 59	9 12
20	18 32	19 54	6 11	7 17	8 26	9 34
10	18 15	19 31	6 34	7 41	8 49	9 53
0	18 00	19 13	6 57	8 04	9 10	10 11
10	17 45	18 59	7 19	8 27	9 31	10 29
20	17 29	18 46	7 43	8 52	9 54	10 48
30	17 11	18 35	8 10	9 20	10 20	11 10
35	17 00	18 29	8 27	9 37	10 35	11 23
40	16 48	18 23	8 46	9 56	10 53	11 37
45	16 34	18 18	9 09	10 20	11 14	11 54
50	16 17	18 12	9 39	10 50	11 41	12 15
52	16 09	18 10	9 54	11 05	11 54	12 25
54	16 00	18 08	10 11	11 22	12 08	12 36
56	15 49	18 04	10 31	11 43	12 25	12 49
58	15 38	18 02	10 57	12 09	12 46	13 04
60	15 24	17 59	11 32	12 45	13 12	13 21
S						

GCT	Equation of Time (App.—Mean) 22	23	24
h	m s	m s	m s
0	+ 3 31.8	+ 3 27.9	+ 3 23.4
6	+ 3 30.9	+ 3 26.8	+ 3 22.2
12	+ 3 29.9	+ 3 25.7	+ 3 20.9
18	+ 3 28.9	+ 3 24.5	+ 3 19.6
24	+ 3 27.9	+ 3 23.4	+ 3 18.3

GCT of Transit Meridian of Greenwich

DAY	Moon	Venus	Mars	Jupiter	Saturn
	h m	h m	h m	h m	h m
22	0 41	15 00	11 56	8 29	19 49
23	1 48	15 01	11 55	8 25	19 45
24	2 55	15 02	11 54	8 22	19 41
25	3 57	15 03	11 53	8 19	19 37

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb	Venus	Mars
°	′	′	′
0–30	0.1	0.1	0.1
30–45	0.1	0.1	0.0
45–60	0.1	0.1	0.0
60–75	0.1	0.1	0.0
75–90	0.1	0.0	0.0

Moon's Lower Limb *Add*

Alt.	22	23	24
°	′	′	′
0–4	20.9	20.5	19.9
4–8	20.9	20.5	19.9
8–12	20.8	20.5	19.8
12–16	20.8	20.4	19.8
16–20	20.7	20.3	19.7
20–24	20.6	20.2	19.6
24–28	20.5	20.1	19.5
28–32	20.3	20.0	19.4
32–36	20.2	19.8	19.3
36–40	20.0	19.7	19.2
40–44	19.8	19.5	19.0
44–48	19.6	19.3	18.8
48–52	19.4	19.1	18.7
52–56	19.2	18.9	18.5
56–60	18.9	18.7	18.3
60–64	18.7	18.4	18.1
64–68	18.4	18.2	17.9
68–72	18.1	17.9	17.6
72–76	17.9	17.7	17.4
76–80	17.6	17.4	17.2
80–84	17.3	17.2	17.0
84–88	17.0	16.9	16.7
88–90	16.8	16.7	16.5

Add to table, back cover

Moon's Upper Limb *Subtract*

Alt.	22	23	24
°	′	′	′
0–4	12.5	12.7	13.1
4–8	12.5	12.7	13.1
8–12	12.6	12.8	13.1
12–16	12.6	12.8	13.2
16–20	12.7	12.9	13.2
20–24	12.8	13.0	13.3
24–28	12.9	13.1	13.4
28–32	13.1	13.2	13.5
32–36	13.2	13.4	13.7
36–40	13.4	13.5	13.8
40–44	13.6	13.7	13.9
44–48	13.8	13.9	14.1
48–52	14.0	14.1	14.3
52–56	14.2	14.3	14.5
56–60	14.5	14.5	14.7
60–64	14.7	14.8	14.9
64–68	15.0	15.0	15.1
68–72	15.3	15.3	15.3
72–76	15.5	15.5	15.5
76–80	15.8	15.8	15.8
80–84	16.1	16.1	16.0
84–88	16.4	16.3	16.2
88–90	16.6	16.5	16.4

Subtract from table, back cover

Corpus Christi 24

GCT	♈ GHA	VENUS −3.7 GHA	VENUS Dec.	MARS 1.6 GHA	MARS Dec.	JUPITER −1.8 GHA	JUPITER Dec.	SATURN 1.2 GHA	SATURN Dec.	MOON GHA	code	Dec.	code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
0	241 46.3	134 26.7	+25 00.1	181 31.6	+20 53.0	234 59.7	+ 1 40.1	64 53.3	+ 3 59.2	303 02.2	46	−24 43.7	+ 91
1	256 48.7	149 26.1	24 59.8	196 32.2	53.4	250 01.7	40.3	79 55.8	59.2	317 25.8	49	24 34.6	+ 92
2	271 51.2	164 25.6	59.5	211 32.8	53.7	265 03.7	40.5	94 58.3	59.2	331 49.7	49	24 25.4	+ 94
3	286 53.6	179 25.0	·· 59.2	226 33.4	·· 54.1	280 05.8	·· 40.6	110 00.7	·· 59.2	346 13.6	51	·24 16.0	+ 95
4	301 56.1	194 24.4	58.9	241 34.0	54.5	295 07.8	40.8	125 03.2	59.2	0 37.7	52	24 06.5	+ 97
5	316 58.6	209 23.9	58.5	256 34.6	54.9	310 09.9	41.0	140 05.7	59.2	15 01.9	54	23 56.8	+ 98
6	332 01.0	224 23.3	+24 58.2	271 35.2	+20 55.2	325 11.9	+ 1 41.1	155 08.2	+ 3 59.2	29 26.3	55	−23 47.0	+100
7	347 03.5	239 22.8	57.9	286 35.9	55.6	340 13.9	41.3	170 10.7	59.2	43 50.8	57	23 37.0	+102
8	2 06.0	254 22.2	57.6	301 36.5	56.0	355 16.0	41.5	185 13.2	59.2	58 15.5	57	23 26.8	+102
9	17 08.4	269 21.6	·· 57.2	316 37.1	·· 56.3	10 18.0	·· 41.7	200 15.6	·· 59.2	72 40.2	60	·23 16.6	+104
10	32 10.9	284 21.1	56.9	331 37.7	56.7	25 20.1	41.8	215 18.1	59.2	87 05.2	60	23 06.2	+106
11	47 13.4	299 20.5	56.6	346 38.3	57.1	40 22.1	42.0	230 20.6	59.2	101 30.2	62	22 55.6	+106
12	62 15.8	314 20.0	+24 56.3	1 38.9	+20 57.5	55 24.1	+ 1 42.2	245 23.1	+ 3 59.2	115 55.4	64	−22 45.0	+108
13	77 18.3	329 19.4	55.9	16 39.5	57.8	70 26.2	42.4	260 25.6	59.2	130 20.8	65	22 34.2	+110
14	92 20.8	344 18.9	55.6	31 40.2	58.2	85 28.2	42.5	275 28.1	59.2	144 46.3	66	22 23.2	+110
15	107 23.2	359 18.3	·· 55.3	46 40.8	·· 58.6	100 30.3	·· 42.7	290 30.5	·· 59.2	159 11.9	67	·22 12.2	+112
16	122 25.7	14 17.7	54.9	61 41.4	58.9	115 32.3	42.9	305 33.0	59.2	173 37.6	69	22 01.0	+113
17	137 28.1	29 17.2	54.6	76 42.0	59.3	130 34.3	43.1	320 35.5	59.2	188 03.5	71	21 49.7	+114
18	152 30.6	44 16.6	+24 54.3	91 42.6	+20 59.7	145 36.4	+ 1 43.2	335 38.0	+ 3 59.2	202 29.6	72	−21 38.3	+116
19	167 33.1	59 16.1	53.9	106 43.2	21 00.0	160 38.4	43.4	350 40.5	59.2	216 55.8	73	21 26.7	+117
20	182 35.5	74 15.5	53.6	121 43.8	00.4	175 40.5	43.6	5 42.9	59.2	231 22.1	74	21 15.0	+117
21	197 38.0	89 15.0	·· 53.3	136 44.5	·· 00.8	190 42.5	·· 43.7	20 45.4	·· 59.2	245 48.5	76	·21 03.3	+119
22	212 40.5	104 14.4	52.9	151 45.1	01.1	205 44.6	43.9	35 47.9	59.2	260 15.1	77	20 51.4	+120
23	227 42.9	119 13.9	52.6	166 45.7	01.5	220 46.6	44.1	50 50.4	59.2	274 41.8	79	20 39.4	+121
0	242 45.4	134 13.3	+24 52.3	181 46.3	+21 01.9	235 48.7	+ 1 44.3	65 52.9	+ 3 59.1	289 08.7	80	−20 27.3	+122
1	257 47.9	149 12.8	51.9	196 46.9	02.2	250 50.7	44.4	80 55.3	59.1	303 35.7	81	20 15.1	+124
2	272 50.3	164 12.2	51.6	211 47.5	02.6	265 52.7	44.6	95 57.8	59.1	318 02.8	83	20 02.7	+124
3	287 52.8	179 11.7	·· 51.2	226 48.1	·· 03.0	280 54.8	·· 44.8	111 00.3	·· 59.1	332 30.1	84	·19 50.3	+125
4	302 55.3	194 11.1	50.9	241 48.8	03.3	295 56.8	44.9	126 02.8	59.1	346 57.5	86	19 37.8	+126
5	317 57.7	209 10.6	50.5	256 49.4	03.7	310 58.9	45.1	141 05.3	59.1	1 25.1	86	19 25.2	+127
6	333 00.2	224 10.1	+24 50.2	271 50.0	+21 04.1	326 00.9	+ 1 45.3	156 07.7	+ 3 59.1	15 52.7	88	−19 12.5	+128
7	348 02.6	239 09.5	49.9	286 50.6	04.4	341 03.0	45.5	171 10.2	59.1	30 20.5	90	18 59.7	+129
8	3 05.1	254 09.0	49.5	301 51.2	04.8	356 05.0	45.6	186 12.7	59.1	44 48.5	90	18 46.8	+130
9	18 07.6	269 08.4	·· 49.2	316 51.8	·· 05.1	11 07.0	·· 45.8	201 15.2	·· 59.1	59 16.5	92	·18 33.8	+131
10	33 10.0	284 07.9	48.8	331 52.4	05.5	26 09.1	46.0	216 17.7	59.1	73 44.7	93	18 20.7	+132
11	48 12.5	299 07.3	48.5	346 53.0	05.9	41 11.1	46.1	231 20.1	59.1	88 13.0	95	18 07.5	+132
12	63 15.0	314 06.8	+24 48.1	1 53.7	+21 06.2	56 13.2	+ 1 46.3	246 22.6	+ 3 59.1	102 41.5	96	−17 54.3	+133
13	78 17.4	329 06.3	47.7	16 54.3	06.6	71 15.2	46.5	261 25.1	59.1	117 10.1	97	17 41.0	+135
14	93 19.9	344 05.7	47.4	31 54.9	07.0	86 17.3	46.7	276 27.6	59.1	131 38.8	98	17 27.5	+134
15	108 22.4	359 05.2	·· 47.0	46 55.5	·· 07.3	101 19.3	·· 46.8	291 30.0	·· 59.1	146 07.6	99	·17 14.1	+136
16	123 24.8	14 04.6	46.7	61 56.1	07.7	116 21.4	47.0	306 32.5	59.1	160 36.5	101	17 00.5	+136
17	138 27.3	29 04.1	46.3	76 56.7	08.0	131 23.4	47.2	321 35.0	59.1	175 05.6	102	16 46.9	+138
18	153 29.8	44 03.6	+24 46.0	91 57.3	+21 08.4	146 25.5	+ 1 47.3	336 37.5	+ 3 59.1	189 34.8	103	−16 33.1	+137
19	168 32.2	59 03.0	45.6	106 58.0	08.8	161 27.5	47.5	351 40.0	59.1	204 04.1	104	16 19.4	+139
20	183 34.7	74 02.5	45.2	121 58.6	09.1	176 29.6	47.7	6 42.4	59.1	218 33.5	106	16 05.5	+139
21	198 37.1	89 02.0	·· 44.9	136 59.2	·· 09.5	191 31.6	·· 47.9	21 44.9	·· 59.1	233 03.1	106	·15 51.6	+140
22	213 39.6	104 01.4	44.5	151 59.8	09.8	206 33.6	48.0	36 47.4	59.1	247 32.7	108	15 37.6	+140
23	228 42.1	119 00.9	44.2	167 00.4	10.2	221 35.7	48.2	51 49.9	59.1	262 02.5	109	15 23.6	+141
0	243 44.5	134 00.4	+24 43.8	182 01.0	+21 10.5	236 37.7	+ 1 48.4	66 52.3	+ 3 59.1	276 32.4	110	−15 09.5	+142
1	258 47.0	148 59.8	43.4	197 01.6	10.9	251 39.8	48.5	81 54.8	59.1	291 02.4	111	14 55.3	+142
2	273 49.5	163 59.3	43.1	212 02.2	11.3	266 41.8	48.7	96 57.3	59.1	305 32.5	112	14 41.1	+143
3	288 51.9	178 58.8	·· 42.7	227 02.9	·· 11.6	281 43.9	·· 48.9	111 59.8	·· 59.1	320 02.7	113	·14 26.8	+144
4	303 54.4	193 58.2	42.3	242 03.5	12.0	296 45.9	49.1	127 02.2	59.0	334 33.0	115	14 12.4	+144
5	318 56.9	208 57.7	41.9	257 04.1	12.3	311 48.0	49.2	142 04.7	59.0	349 03.5	115	13 58.0	+144
6	333 59.3	223 57.2	+24 41.6	272 04.7	+21 12.7	326 50.0	+ 1 49.4	157 07.2	+ 3 59.0	3 34.0	117	−13 43.6	+145
7	349 01.8	238 56.6	41.2	287 05.3	13.0	341 52.1	49.6	172 09.7	59.0	18 04.7	117	13 29.1	+146
8	4 04.2	253 56.1	40.8	302 05.9	13.4	356 54.1	49.7	187 12.1	59.0	32 35.4	119	13 14.5	+146
9	19 06.7	268 55.6	·· 40.5	317 06.5	·· 13.7	11 56.2	·· 49.9	202 14.6	·· 59.0	47 06.3	119	·12 59.9	+146
10	34 09.2	283 55.1	40.1	332 07.1	14.1	26 58.2	50.1	217 17.1	59.0	61 37.2	121	12 45.3	+147
11	49 11.6	298 54.5	39.7	347 07.7	14.4	42 00.3	50.2	232 19.6	59.0	76 08.3	121	12 30.6	+147
12	64 14.1	313 54.0	+24 39.3	2 08.4	+21 14.8	57 02.3	+ 1 50.4	247 22.0	+ 3 59.0	90 39.4	123	−12 15.9	+148
13	79 16.6	328 53.5	38.9	17 09.0	15.2	72 04.4	50.6	262 24.5	59.0	105 10.7	123	12 01.1	+148
14	94 19.0	343 53.0	38.6	32 09.6	15.5	87 06.4	50.8	277 27.0	59.0	119 42.0	124	11 46.3	+148
15	109 21.5	358 52.4	·· 38.2	47 10.2	·· 15.9	102 08.5	·· 50.9	292 29.5	·· 59.0	134 13.4	126	·11 31.5	+149
16	124 24.0	13 51.9	37.8	62 10.8	16.2	117 10.5	51.1	307 31.9	59.0	148 45.0	126	11 16.6	+149
17	139 26.4	28 51.4	37.4	77 11.4	16.6	132 12.6	51.3	322 34.4	59.0	163 16.6	127	11 01.7	+150
18	154 28.9	43 50.9	+24 37.0	92 12.0	+21 16.9	147 14.6	+ 1 51.4	337 36.9	+ 3 59.0	177 48.3	128	−10 46.7	+150
19	169 31.4	58 50.3	36.7	107 12.6	17.3	162 16.7	51.6	352 39.3	59.0	192 20.1	128	10 31.7	+150
20	184 33.8	73 49.8	36.3	122 13.3	17.6	177 18.7	51.8	7 41.8	59.0	206 51.9	130	10 16.7	+150
21	199 36.3	88 49.3	·· 35.9	137 13.9	·· 18.0	192 20.8	·· 51.9	22 44.3	·· 59.0	221 23.9	130	·10 01.7	+151
22	214 38.7	103 48.8	35.5	152 14.5	18.3	207 22.8	52.1	37 46.8	59.0	235 55.9	131	9 46.6	+151
23	229 41.2	118 48.3	35.1	167 15.1	18.7	222 24.9	52.3	52 49.2	58.9	250 28.0	133	9 31.5	+151
24	244 43.7	133 47.7	+24 34.7	182 15.7	+21 19.0	237 26.9	+ 1 52.4	67 51.7	+ 3 58.9	265 00.3	132	− 9 16.4	+152
code	—	− 5	− 4	+ 6	+ 4	+ 20	+ 2	+ 25	0				

GCT	SUN GHA	SUN Dec.
h	° ′	° ′
0	180 49.6	+20 45.8
1	195 49.5	46.3
2	210 49.4	46.8
3	225 49.4	47.2
4	240 49.3	47.7
5	255 49.3	48.2
6	270 49.2	+20 48.6
7	285 49.2	49.1
8	300 49.1	49.5
9	315 49.0	50.0
10	330 49.0	50.5
11	345 48.9	50.9
12	0 48.9	+20 51.4
13	15 48.8	51.8
14	30 48.8	52.3
15	45 48.7	52.7
16	60 48.6	53.2
17	75 48.6	53.6
18	90 48.5	+20 54.1
19	105 48.5	54.5
20	120 48.4	55.0
21	135 48.3	55.5
22	150 48.3	55.9
23	165 48.2	56.4
0	180 48.2	+20 56.8
1	195 48.1	57.3
2	210 48.0	57.7
3	225 48.0	58.1
4	240 47.9	58.6
5	255 47.8	59.0
6	270 47.8	+20 59.5
7	285 47.7	20 59.9
8	300 47.7	21 00.4
9	315 47.6	00.8
10	330 47.5	01.3
11	345 47.5	01.7
12	0 47.4	+21 02.1
13	15 47.3	02.6
14	30 47.3	03.0
15	45 47.2	03.5
16	60 47.2	03.9
17	75 47.1	04.3
18	90 47.0	+21 04.8
19	105 47.0	05.2
20	120 46.9	05.7
21	135 46.8	06.1
22	150 46.8	06.5
23	165 46.7	07.0
0	180 46.6	+21 07.4
1	195 46.6	07.8
2	210 46.5	08.3
3	225 46.4	08.7
4	240 46.4	09.1
5	255 46.3	09.6
6	270 46.2	+21 10.0
7	285 46.2	10.4
8	300 46.1	10.9
9	315 46.0	11.3
10	330 46.0	11.7
11	345 45.9	12.1
12	0 45.8	+21 12.6
13	15 45.8	13.0
14	30 45.7	13.4
15	45 45.6	13.8
16	60 45.5	14.3
17	75 45.5	14.7
18	90 45.4	+21 15.1
19	105 45.3	15.5
20	120 45.3	16.0
21	135 45.2	16.4
22	150 45.1	16.8
23	165 45.1	17.2
24	180 45.0	+21 17.6
	–	+ 5

No.	SHA	Dec.	Transit Mer. Gr.
	° ′	° ′	h m
1	358 32.1	+28 49.2	7 54
2	358 21.9	+58 52.6	7 54
3	349 42.8	−18 15.1	8 29
4	339 21.4	+59 58.8	9 10
5	336 01.6	−57 28.7	9 23
6	332 56.3	+89 02.0	9 36
7	328 53.9	+23 14.0	9 52
8	315 54.0	−40 29.8	10 44
9	309 47.9	+49 41.4	11 08
10	291 43.4	+16 24.9	12 20
11	281 57.3	− 8 15.3	12 59
12	281 44.0	+45 57.2	13 00
13	279 22.4	+ 6 18.5	13 09
14	279 12.1	+28 34.2	13 10
15	276 34.1	− 1 13.8	13 21
16	271 52.2	+ 7 24.1	13 39
17	264 17.4	−52 40.1	14 09
18	259 15.2	−16 38.8	14 30
19	255 49.6	−28 54.3	14 43
20	245 48.8	+ 5 21.1	15 23
21	244 25.0	+28 08.9	15 29
22	234 37.7	−59 21.3	16 08
23	223 27.1	−43 14.3	16 52
24	221 50.4	−69 31.2	16 59
25	218 42.1	− 8 26.9	17 11
26	208 33.2	+12 12.4	17 52
27	194 48.4	+62 01.1	18 47
28	183 21.1	+14 50.6	19 32
29	174 01.6	−62 50.1	20 10
30	172 53.0	−56 50.8	20 14
31	168 46.8	−59 25.7	20 30
32	167 01.0	+56 13.5	20 38
33	159 29.8	+55 10.8	21 08
34	159 20.3	−10 54.7	21 08
35	153 35.0	+49 33.4	21 31
36	149 02.5	−36 08.2	21 49
37	146 38.0	+19 26.0	21 59
38	140 55.3	−60 38.5	22 22
39	137 16.2	+74 21.3	22 36
40	126 50.1	+26 52.5	23 18
41	120 37.8	−22 29.3	23 43
42	113 23.2	−26 19.7	0 15
43	109 06.6	−68 56.6	0 32
44	103 05.8	−15 40.2	0 56
45	97 25.0	−37 04.4	1 19
46	96 49.5	+12 35.4	1 21
47	91 07.3	+51 29.4	1 44
48	84 45.4	−34 24.7	2 10
49	81 10.2	+38 44.0	2 24
50	76 55.8	−26 21.6	2 41
51	62 53.6	+ 8 44.1	3 37
52	54 32.2	−56 53.5	4 10
53	50 03.2	+45 06.0	4 28
54	34 32.9	+ 9 38.9	5 30
55	28 42.1	−47 11.7	5 53
56	16 15.4	−29 52.7	6 43
57	14 25.0	+14 56.5	6 50

Lat.	Sunrise	Twlt. begins	Moonrise 25	26	27	28
N °	h m	h m	h m	h m	h m	h m
70	□	□	■	4 14	2 43	2 06
68	0 29	////	■	3 07	2 21	1 55
66	1 40	////	■	2 30	2 04	1 46
64	2 16	////	2 31	2 04	1 50	1 39
62	2 41	////	1 50	1 43	1 38	1 32
60	3 01	////	1 22	1 26	1 27	1 27
58	3 17	////	1 01	1 12	1 18	1 22
56	3 30	////	0 43	1 00	1 10	1 17
54	3 42	////	0 27	0 49	1 03	1 13
52	3 52	////	0 14	0 39	0 57	1 10
50	4 02	0 53	0 02	0 31	0 51	1 06
45	4 21	2 04	24 12	0 12	0 38	0 59
40	4 37	2 41	23 57	24 28	0 28	0 53
35	4 50	3 08	23 44	24 19	0 19	0 48
30	5 01	3 29	23 33	24 11	0 11	0 43
20	5 21	3 59	23 14	23 57	24 35	0 35
10	5 38	4 22	22 57	23 45	24 28	0 28
0	5 53	4 39	22 41	23 34	24 21	0 21
10	6 09	4 55	22 25	23 22	24 14	0 14
20	6 25	5 08	22 08	23 10	24 07	0 07
30	6 44	5 19	21 48	22 56	23 59	24 59
35	6 55	5 25	21 37	22 48	23 54	24 57
40	7 07	5 31	21 24	22 38	23 49	24 56
45	7 22	5 37	21 08	22 27	23 42	24 54
50	7 40	5 42	20 48	22 14	23 35	24 51
52	7 48	5 46	20 39	22 07	23 31	24 50
54	7 58	5 48	20 28	22 01	23 27	24 49
56	8 08	5 51	20 16	21 53	23 23	24 48
58	8 20	5 54	20 02	21 44	23 18	24 47
60	8 34	5 56	19 46	21 34	23 12	24 45
S						

Lat.	Sunset	Twlt. ends	Moonset 25	26	27	28
N °	h m	h m	h m	h m	h m	h m
70	□	□	■	5 57	9 13	11 28
68	23 47	////	■	7 02	9 33	11 36
66	22 17	////	■	7 37	9 49	11 43
64	21 40	////	5 38	8 02	10 01	11 48
62	21 15	////	6 17	8 22	10 12	11 53
60	20 55	////	6 45	8 38	10 21	11 57
58	20 38	////	7 06	8 51	10 29	12 01
56	20 25	////	7 23	9 02	10 36	12 04
54	20 13	////	7 38	9 12	10 42	12 07
52	20 02	////	7 50	9 21	10 48	12 09
50	19 53	23 07	8 01	9 29	10 53	12 12
45	19 33	21 52	8 24	9 46	11 04	12 17
40	19 18	21 14	8 43	10 00	11 12	12 21
35	19 04	20 46	8 58	10 11	11 20	12 25
30	18 53	20 26	9 12	10 21	11 26	12 28
20	18 33	19 55	9 34	10 38	11 38	12 33
10	18 16	19 32	9 53	10 53	11 48	12 38
0	18 00	19 14	10 11	11 07	11 57	12 43
10	17 45	18 59	10 29	11 20	12 06	12 47
20	17 29	18 46	10 48	11 35	12 15	12 52
30	17 10	18 34	11 10	11 51	12 26	12 57
35	16 59	18 28	11 23	12 01	12 32	13 00
40	16 46	18 22	11 37	12 12	12 39	13 03
45	16 32	18 16	11 54	12 24	12 47	13 07
50	16 14	18 10	12 15	12 39	12 57	13 12
52	16 05	18 07	12 25	12 46	13 02	13 14
54	15 56	18 04	12 36	12 54	13 07	13 16
56	15 45	18 01	12 49	13 03	13 12	13 18
58	15 33	17 59	13 04	13 13	13 18	13 21
60	15 19	17 56	13 21	13 24	13 25	13 24
S						

Equation of Time (App.—Mean)

GCT	25	26	27
h	m s	m s	m s
0	+ 3 18.3	+ 3 12.8	+ 3 06.7
6	+ 3 17.0	+ 3 11.3	+ 3 05.1
12	+ 3 15.6	+ 3 09.8	+ 3 03.4
18	+ 3 14.2	+ 3 08.2	+ 3 01.8
24	+ 3 12.8	+ 3 06.7	+ 3 00.1

GCT of Transit Meridian of Greenwich

DAY	Moon	Venus	Mars	Jupiter	Saturn
	h m	h m	h m	h m	h m
25	3 57	15 03	11 53	8 19	19 37
26	4 54	15 04	11 52	8 16	19 33
27	5 45	15 05	11 52	8 12	19 29
28	6 32	15 05	11 51	8 09	19 25

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb	Venus	Mars
°	′	′	′
0	0.1	0.1	0.1
30	0.1	0.1	0.0
45	0.1	0.1	0.0
60	0.1	0.1	0.0
75	0.1	0.0	0.0
90			

Moon's Lower Limb *Add*

Alt.	25	26	27
°	′	′	′
0	19.0	18.0	16.9
4	19.0	18.0	16.9
8	18.9	17.9	16.9
12	18.9	17.9	16.9
16	18.9	17.9	16.9
20	18.8	17.8	16.9
24	18.7	17.8	16.8
28	18.6	17.7	16.8
32	18.5	17.6	16.8
36	18.4	17.6	16.7
40	18.3	17.5	16.7
44	18.2	17.4	16.6
48	18.0	17.3	16.6
52	17.9	17.2	16.5
56	17.7	17.1	16.4
60	17.6	17.0	16.4
64	17.4	16.8	16.3
68	17.2	16.7	16.2
72	17.0	16.6	16.2
76	16.8	16.5	16.1
80	16.7	16.3	16.0
84	16.5	16.2	15.9
88	16.3	16.1	15.9
90			

Add to table, back cover

Moon's Upper Limb *Subtract*

Alt.	25	26	27
°	′	′	′
0	13.6	14.2	14.8
4	13.6	14.2	14.8
8	13.6	14.2	14.8
12	13.7	14.2	14.8
16	13.7	14.3	14.8
20	13.8	14.3	14.8
24	13.9	14.4	14.9
28	13.9	14.4	14.9
32	14.0	14.5	14.9
36	14.2	14.6	15.0
40	14.3	14.7	15.0
44	14.4	14.7	15.1
48	14.5	14.8	15.1
52	14.7	15.0	15.2
56	14.9	15.1	15.3
60	15.0	15.2	15.3
64	15.2	15.3	15.4
68	15.4	15.4	15.5
72	15.5	15.5	15.5
76	15.7	15.7	15.6
80	15.9	15.8	15.7
84	16.1	15.9	15.8
88	16.2	16.0	15.8
90			

Subtract from table, back cover

Last Quarter 27

GCT	♈ GHA	VENUS −3.7 GHA	VENUS Dec.	MARS 1.6 GHA	MARS Dec.	JUPITER −1.8 GHA	JUPITER Dec.	SATURN 1.2 GHA	SATURN Dec.	MOON GHA	code	MOON Dec.	code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
0	244 43.7	133 47.7	+24 34.7	182 15.7	+21 19.0	237 26.9	+ 1 52.4	67 51.7	+ 3 58.9	265 00.3	132	− 9 16.4	+152
1	259 46.1	148 47.2	34.3	197 16.3	19.4	252 29.0	52.6	82 54.2	58.9	279 32.5	134	9 01.2	+152
2	274 48.6	163 46.7	33.9	212 16.9	19.7	267 31.0	52.8	97 56.7	58.9	294 04.9	134	8 46.0	+152
3	289 51.1	178 46.2	·· 33.5	227 17.5	·· 20.1	282 33.1	·· 52.9	112 59.1	·· 58.9	308 37.3	135	· 8 30.8	+152
4	304 53.5	193 45.7	33.1	242 18.1	20.4	297 35.1	53.1	128 01.6	58.9	323 09.8	136	8 15.6	+152
5	319 56.0	208 45.2	32.7	257 18.7	20.8	312 37.2	53.3	143 04.1	58.9	337 42.4	137	8 00.4	+153
6	334 58.5	223 44.7	+24 32.4	272 19.4	+21 21.1	327 39.2	+ 1 53.5	158 06.5	+ 3 58.9	352 15.1	137	− 7 45.1	+153
7	350 00.9	238 44.1	32.0	287 20.0	21.4	342 41.3	53.6	173 09.0	58.9	6 47.8	138	7 29.8	+153
8	5 03.4	253 43.6	31.6	302 20.6	21.8	357 43.3	53.8	188 11.5	58.9	21 20.6	138	7 14.5	+153
9	20 05.9	268 43.1	·· 31.2	317 21.2	·· 22.1	12 45.4	·· 54.0	203 13.9	·· 58.9	35 53.4	140	· 6 59.2	+153
10	35 08.3	283 42.6	30.8	332 21.8	22.5	27 47.4	54.1	218 16.4	58.9	50 26.4	140	6 43.9	+153
11	50 10.8	298 42.1	30.4	347 22.4	22.8	42 49.5	54.3	233 18.9	58.9	64 59.4	140	6 28.6	+154
12	65 13.2	313 41.6	+24 30.0	2 23.0	+21 23.2	57 51.5	+ 1 54.5	248 21.4	+ 3 58.9	79 32.4	141	− 6 13.2	+153
13	80 15.7	328 41.1	29.5	17 23.6	23.5	72 53.6	54.6	263 23.8	58.9	94 05.5	142	5 57.9	+154
14	95 18.2	343 40.6	29.1	32 24.2	23.9	87 55.7	54.8	278 26.3	58.8	108 38.7	142	5 42.5	+153
15	110 20.6	358 40.1	·· 28.7	47 24.9	·· 24.2	102 57.7	·· 55.0	293 28.8	·· 58.8	123 11.9	143	· 5 27.2	+154
16	125 23.1	13 39.6	28.3	62 25.5	24.5	117 59.8	55.1	308 31.2	58.8	137 45.2	144	5 11.8	+154
17	140 25.6	28 39.1	27.9	77 26.1	24.9	133 01.8	55.3	323 33.7	58.8	152 18.6	144	4 56.4	+154
18	155 28.0	43 38.5	+24 27.5	92 26.7	+21 25.2	148 03.9	+ 1 55.5	338 36.2	+ 3 58.8	166 52.0	144	− 4 41.0	+154
19	170 30.5	58 38.0	27.1	107 27.3	25.6	163 05.9	55.6	353 38.6	58.8	181 25.4	145	4 25.6	+154
20	185 33.0	73 37.5	26.7	122 27.9	25.9	178 08.0	55.8	8 41.1	58.8	195 58.9	146	4 10.2	+153
21	200 35.4	88 37.0	·· 26.3	137 28.5	·· 26.3	193 10.0	·· 56.0	23 43.6	·· 58.8	210 32.5	146	· 3 54.9	+154
22	215 37.9	103 36.5	25.9	152 29.1	26.6	208 12.1	56.1	38 46.1	58.8	225 06.1	146	3 39.5	+154
23	230 40.4	118 36.0	25.5	167 29.7	26.9	223 14.1	56.3	53 48.5	58.8	239 39.7	147	3 24.1	+154
0	245 42.8	133 35.5	+24 25.0	182 30.3	+21 27.3	238 16.2	+ 1 56.5	68 51.0	+ 3 58.8	254 13.4	147	− 3 08.7	+154
1	260 45.3	148 35.0	24.6	197 30.9	27.6	253 18.2	56.6	83 53.5	58.8	268 47.1	148	2 53.3	+154
2	275 47.7	163 34.5	24.2	212 31.6	28.0	268 20.3	56.8	98 55.9	58.8	283 20.9	148	2 37.9	+154
3	290 50.2	178 34.0	·· 23.8	227 32.2	·· 28.3	283 22.4	·· 57.0	113 58.4	·· 58.7	297 54.7	149	· 2 22.5	+153
4	305 52.7	193 33.5	23.4	242 32.8	28.6	298 24.4	57.1	129 00.9	58.7	312 28.6	149	2 07.2	+154
5	320 55.1	208 33.0	23.0	257 33.4	29.0	313 26.5	57.3	144 03.3	58.7	327 02.5	149	1 51.8	+153
6	335 57.6	223 32.5	+24 22.5	272 34.0	+21 29.3	328 28.5	+ 1 57.5	159 05.8	+ 3 58.7	341 36.4	150	− 1 36.5	+154
7	351 00.1	238 32.1	22.1	287 34.6	29.7	343 30.6	57.6	174 08.3	58.7	356 10.4	150	1 21.1	+153
8	6 02.5	253 31.6	21.7	302 35.2	30.0	358 32.6	57.8	189 10.7	58.7	10 44.4	151	1 05.8	+154
9	21 05.0	268 31.1	·· 21.3	317 35.8	·· 30.3	13 34.7	·· 58.0	204 13.2	·· 58.7	25 18.5	150	· 0 50.4	+153
10	36 07.5	283 30.6	20.8	332 36.4	30.7	28 36.7	58.1	219 15.7	58.7	39 52.5	151	0 35.1	+153
11	51 09.9	298 30.1	20.4	347 37.0	31.0	43 38.8	58.3	234 18.1	58.7	54 26.6	152	0 19.8	+153
12	66 12.4	313 29.6	+24 20.0	2 37.6	+21 31.3	58 40.9	+ 1 58.5	249 20.6	+ 3 58.7	69 00.8	151	− 0 04.5	+152
13	81 14.8	328 29.1	19.6	17 38.3	31.7	73 42.9	58.6	264 23.1	58.7	83 34.9	152	+ 0 10.7	+153
14	96 17.3	343 28.6	19.1	32 38.9	32.0	88 45.0	58.8	279 25.5	58.7	98 09.1	152	0 26.0	+152
15	111 19.8	358 28.1	·· 18.7	47 39.5	·· 32.3	103 47.0	·· 59.0	294 28.0	·· 58.6	112 43.3	153	· 0 41.2	+152
16	126 22.2	13 27.6	18.3	62 40.1	32.7	118 49.1	59.1	309 30.5	58.6	127 17.6	152	0 56.4	+152
17	141 24.7	28 27.1	17.8	77 40.7	33.0	133 51.1	59.3	324 32.9	58.6	141 51.8	153	1 11.6	+152
18	156 27.2	43 26.6	+24 17.4	92 41.3	+21 33.3	148 53.2	+ 1 59.5	339 35.4	+ 3 58.6	156 26.1	153	+ 1 26.8	+152
19	171 29.6	58 26.2	17.0	107 41.9	33.7	163 55.3	59.6	354 37.9	58.6	171 00.4	153	1 42.0	+151
20	186 32.1	73 25.7	16.5	122 42.5	34.0	178 57.3	1 59.8	9 40.3	58.6	185 34.7	154	1 57.1	+152
21	201 34.6	88 25.2	·· 16.1	137 43.1	·· 34.3	193 59.4	· 2 00.0	24 42.8	·· 58.6	200 09.1	153	· 2 12.3	+150
22	216 37.0	103 24.7	15.7	152 43.7	34.7	209 01.4	00.1	39 45.3	58.6	214 43.4	154	2 27.3	+151
23	231 39.5	118 24.2	15.2	167 44.3	35.0	224 03.5	00.3	54 47.7	58.6	229 17.8	154	2 42.4	+151
0	246 42.0	133 23.7	+24 14.8	182 45.0	+21 35.3	239 05.6	+ 2 00.5	69 50.2	+ 3 58.6	243 52.2	154	+ 2 57.5	+150
1	261 44.4	148 23.3	14.3	197 45.6	35.7	254 07.6	00.6	84 52.6	58.6	258 26.6	154	3 12.5	+150
2	276 46.9	163 22.8	13.9	212 46.2	36.0	269 09.7	00.8	99 55.1	58.5	273 01.0	154	3 27.5	+150
3	291 49.3	178 22.3	·· 13.5	227 46.8	·· 36.3	284 11.7	·· 00.9	114 57.6	·· 58.5	287 35.4	154	· 3 42.5	+149
4	306 51.8	193 21.8	13.0	242 47.4	36.7	299 13.8	01.1	130 00.0	58.5	302 09.8	154	3 57.4	+149
5	321 54.3	208 21.3	12.6	257 48.0	37.0	314 15.8	01.3	145 02.5	58.5	316 44.2	155	4 12.3	+149
6	336 56.7	223 20.8	+24 12.1	272 48.6	+21 37.3	329 17.9	+ 2 01.4	160 05.0	+ 3 58.5	331 18.7	154	+ 4 27.2	+148
7	351 59.2	238 20.4	11.7	287 49.2	37.7	344 20.0	01.6	175 07.4	58.5	345 53.1	155	4 42.0	+149
8	7 01.7	253 19.9	11.2	302 49.8	38.0	359 22.0	01.8	190 09.9	58.5	0 27.6	154	4 56.9	+148
9	22 04.1	268 19.4	·· 10.8	317 50.4	·· 38.3	14 24.1	·· 01.9	205 12.4	·· 58.5	15 02.0	155	· 5 11.7	+147
10	37 06.6	283 18.9	10.3	332 51.0	38.6	29 26.1	02.1	220 14.8	58.5	29 36.5	154	5 26.4	+147
11	52 09.1	298 18.5	09.9	347 51.6	39.0	44 28.2	02.3	235 17.3	58.5	44 10.9	155	5 41.1	+147
12	67 11.5	313 18.0	+24 09.4	2 52.2	+21 39.3	59 30.3	+ 2 02.4	250 19.7	+ 3 58.4	58 45.4	154	+ 5 55.8	+147
13	82 14.0	328 17.5	09.0	17 52.9	39.6	74 32.3	02.6	265 22.2	58.4	73 19.8	155	6 10.5	+146
14	97 16.4	343 17.0	08.5	32 53.5	40.0	89 34.4	02.8	280 24.7	58.4	87 54.3	154	6 25.1	+145
15	112 18.9	358 16.6	·· 08.1	47 54.1	·· 40.3	104 36.5	·· 02.9	295 27.1	·· 58.4	102 28.7	155	· 6 39.6	+146
16	127 21.4	13 16.1	07.6	62 54.7	40.6	119 38.5	03.1	310 29.6	58.4	117 03.2	154	6 54.2	+145
17	142 23.8	28 15.6	07.2	77 55.3	40.9	134 40.6	03.2	325 32.0	58.4	131 37.6	154	7 08.7	+144
18	157 26.3	43 15.2	+24 06.7	92 55.9	+21 41.3	149 42.6	+ 2 03.4	340 34.5	+ 3 58.4	146 12.0	155	+ 7 23.1	+145
19	172 28.8	58 14.7	06.3	107 56.5	41.6	164 44.7	03.6	355 37.0	58.4	160 46.5	154	7 37.6	+143
20	187 31.2	73 14.2	05.8	122 57.1	41.9	179 46.8	03.7	10 39.4	58.4	175 20.9	154	7 51.9	+144
21	202 33.7	88 13.8	·· 05.3	137 57.7	·· 42.2	194 48.8	·· 03.9	25 41.9	·· 58.3	189 55.3	153	· 8 06.3	+143
22	217 36.2	103 13.3	04.9	152 58.3	42.6	209 50.9	04.1	40 44.4	58.3	204 29.6	154	8 20.6	+142
23	232 38.6	118 12.8	04.4	167 58.9	42.9	224 52.9	04.2	55 46.8	58.3	219 04.0	154	8 34.8	+142
24	247 41.1	133 12.4	+24 03.9	182 59.5	+21 43.2	239 55.0	+ 2 04.4	70 49.3	+ 3 58.3	233 38.4	153	+ 8 49.0	+142
code	—	− 5	− 4	+ 7	+ 4	+ 20	+ 1	+ 25	0				

GCT	SUN GHA	SUN Dec.
h	° ′	° ′
0	180 45.0	+21 17.6
1	195 44.9	18.1
2	210 44.8	18.5
3	225 44.8 ··	18.9
4	240 44.7	19.3
5	255 44.6	19.7
6	270 44.6	+21 20.1
7	285 44.5	20.6
8	300 44.4	21.0
9	315 44.3 ··	21.4
10	330 44.3	21.8
11	345 44.2	22.2
12	0 44.1	+21 22.6
13	15 44.0	23.0
14	30 44.0	23.4
15	45 43.9 ··	23.9
16	60 43.8	24.3
17	75 43.7	24.7
18	90 43.7	+21 25.1
19	105 43.6	25.5
20	120 43.5	25.9
21	135 43.4 ··	26.3
22	150 43.4	26.7
23	165 43.3	27.1
0	180 43.2	+21 27.5
1	195 43.1	27.9
2	210 43.1	28.3
3	225 43.0 ··	28.7
4	240 42.9	29.1
5	255 42.8	29.5
6	270 42.7	+21 29.9
7	285 42.7	30.3
8	300 42.6	30.7
9	315 42.5 ··	31.1
10	330 42.4	31.5
11	345 42.4	31.9
12	0 42.3	+21 32.3
13	15 42.2	32.7
14	30 42.1	33.1
15	45 42.0 ··	33.5
16	60 42.0	33.9
17	75 41.9	34.3
18	90 41.8	+21 34.7
19	105 41.7	35.1
20	120 41.6	35.5
21	135 41.6 ··	35.8
22	150 41.5	36.2
23	165 41.4	36.6
0	180 41.3	+21 37.0
1	195 41.2	37.4
2	210 41.2	37.8
3	225 41.1 ··	38.2
4	240 41.0	38.6
5	255 40.9	38.9
6	270 40.8	+21 39.3
7	285 40.7	39.7
8	300 40.7	40.1
9	315 40.6 ··	40.5
10	330 40.5	40.9
11	345 40.4	41.2
12	0 40.3	+21 41.6
13	15 40.2	42.0
14	30 40.2	42.4
15	45 40.1 ··	42.8
16	60 40.0	43.1
17	75 39.9	43.5
18	90 39.8	+21 43.9
19	105 39.7	44.3
20	120 39.6	44.6
21	135 39.6 ··	45.0
22	150 39.5	45.4
23	165 39.4	45.8
24	180 39.3	+21 46.1
code	—	+ 4

STARS No.	SHA	Dec.	Transit Mer. Gr.
	° ′	° ′	h m
1	358 32.1	+28 49.2	7 42
2	358 21.9	+58 52.6	7 42
3	349 42.8	−18 15.1	8 17
4	339 21.4	+59 58.8	8 58
5	336 01.6	−57 28.7	9 12
6	332 55.6	+89 02.0	9 24
7	328 53.9	+23 14.0	9 40
8	315 54.0	−40 29.7	10 32
9	309 47.9	+49 41.4	10 56
10	291 43.4	+16 24.9	12 08
11	281 57.3	− 8 15.3	12 47
12	281 44.0	+45 57.2	12 48
13	279 22.4	+ 6 18.5	12 58
14	279 12.1	+28 34.2	12 58
15	276 34.1	− 1 13.8	13 09
16	271 52.2	+ 7 24.1	13 27
17	264 17.4	−52 40.1	13 58
18	259 15.2	−16 38.8	14 18
19	255 49.6	−28 54.3	14 31
20	245 48.8	+ 5 21.1	15 11
21	244 25.0	+28 08.9	15 17
22	234 37.7	−59 21.3	15 56
23	223 27.1	−43 14.3	16 41
24	221 50.5	−69 31.2	16 47
25	218 42.1	− 8 26.9	17 00
26	208 33.2	+12 12.4	17 40
27	194 48.4	+62 01.1	18 35
28	183 21.1	+14 50.6	19 21
29	174 01.6	−62 50.1	19 58
30	172 53.0	−56 50.8	20 02
31	168 46.8	−59 25.7	20 19
32	167 01.0	+56 13.5	20 26
33	159 29.8	+55 10.8	20 56
34	159 20.3	−10 54.7	20 56
35	153 35.0	+49 33.4	21 19
36	149 02.5	−36 08.2	21 37
37	146 38.0	+19 26.0	21 47
38	140 55.3	−60 38.5	22 10
39	137 16.2	+74 21.3	22 24
40	126 50.1	+26 52.5	23 06
41	120 37.8	−22 29.3	23 31
42	113 23.2	−26 19.7	0 04
43	109 06.6	−68 56.6	0 21
44	103 05.8	−15 40.2	0 45
45	97 24.9	−37 04.4	1 07
46	96 49.5	+12 35.4	1 10
47	91 07.3	+51 29.4	1 32
48	84 45.3	−34 24.7	1 58
49	81 10.2	+38 44.0	2 12
50	76 55.8	−26 21.6	2 29
51	62 53.5	+ 8 44.1	3 25
52	54 32.2	−56 53.5	3 58
53	50 03.2	+45 06.0	4 16
54	34 32.9	+ 9 38.9	5 18
55	28 42.0	−47 11.7	5 41
56	16 15.3	−29 52.7	6 31
57	14 24.9	+14 56.5	6 38

Lat.	Sunrise	Twlt. begins	Moonrise 28	29	30	31
N °	h m	h m	h m	h m	h m	h m
70	▭	▭	2 06	1 37	1 12	0 45
68	▭	▭	1 55	1 34	1 15	0 56
66	1 28	////	1 46	1 32	1 18	1 04
64	2 07	////	1 39	1 30	1 21	1 12
62	2 34	////	1 32	1 28	1 23	1 18
60	2 55	////	1 27	1 26	1 25	1 24
58	3 12	////	1 22	1 24	1 27	1 29
56	3 26	////	1 17	1 23	1 28	1 33
54	3 39	////	1 13	1 22	1 30	1 37
52	3 49	////	1 10	1 21	1 31	1 41
50	3 59	0 37	1 06	1 20	1 32	1 44
45	4 19	2 00	0 59	1 17	1 34	1 52
40	4 35	2 39	0 53	1 15	1 37	1 58
35	4 49	3 06	0 48	1 14	1 38	2 03
30	5 00	3 27	0 43	1 12	1 40	2 08
20	5 20	3 59	0 35	1 10	1 43	2 16
10	5 38	4 22	0 28	1 08	1 46	2 23
0	5 54	4 39	0 21	1 05	1 48	2 30
10	6 10	4 55	0 14	1 03	1 51	2 37
20	6 26	5 08	0 07	1 01	1 53	2 45
30	6 46	5 21	24 59	0 59	1 56	2 53
35	6 57	5 27	24 57	0 57	1 58	2 58
40	7 10	5 33	24 56	0 56	2 00	3 04
45	7 25	5 39	24 54	0 54	2 03	3 10
50	7 43	5 46	24 51	0 51	2 05	3 18
52	7 52	5 49	24 50	0 50	2 07	3 22
54	8 02	5 51	24 49	0 49	2 08	3 26
56	8 13	5 54	24 48	0 48	2 10	3 31
58	8 26	5 57	24 47	0 47	2 12	3 36
60	8 40	6 00	24 45	0 45	2 14	3 42
S						

Lat.	Sunset	Twlt. ends	Moonset 28	29	30	31
N °	h m	h m	h m	h m	h m	h m
70	▭	▭	11 28	13 28	15 26	17 29
68	▭	▭	11 36	13 28	15 17	17 10
66	22 30	////	11 43	13 28	15 11	16 55
64	21 49	////	11 48	13 28	15 05	16 43
62	21 22	////	11 53	13 28	15 00	16 32
60	21 01	////	11 57	13 28	14 56	16 24
58	20 44	////	12 01	13 27	14 52	16 16
56	20 29	////	12 04	13 27	14 49	16 09
54	20 17	////	12 07	13 27	14 46	16 03
52	20 06	////	12 09	13 27	14 43	15 58
50	19 56	23 24	12 12	13 27	14 41	15 53
45	19 36	21 57	12 17	13 27	14 35	15 43
40	19 20	21 18	12 21	13 27	14 31	15 34
35	19 06	20 49	12 25	13 27	14 27	15 27
30	18 54	20 28	12 28	13 27	14 24	15 20
20	18 34	19 56	12 33	13 26	14 18	15 09
10	18 17	19 34	12 38	13 26	14 13	15 00
0	18 01	19 15	12 43	13 26	14 08	14 51
10	17 45	18 59	12 47	13 26	14 03	14 42
20	17 28	18 46	12 52	13 25	13 58	14 32
30	17 09	18 33	12 57	13 25	13 53	14 21
35	16 58	18 27	13 00	13 25	13 50	14 15
40	16 45	18 21	13 03	13 25	13 46	14 08
45	16 30	18 15	13 07	13 25	13 42	14 00
50	16 11	18 08	13 12	13 24	13 37	13 50
52	16 02	18 05	13 14	13 24	13 34	13 45
54	15 53	18 03	13 16	13 24	13 32	13 40
56	15 42	18 00	13 18	13 24	13 29	13 35
58	15 29	17 56	13 21	13 24	13 26	13 29
60	15 14	17 53	13 24	13 24	13 23	13 22
S						

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb	Venus	Mars
°	′	′	′
0			
	0.1	0.1	0.1
30			
	0.1	0.1	0.0
45			
	0.1	0.1	0.0
60			
	0.1	0.1	0.0
75			
	0.1	0.0	0.0
90			

Moon's Lower Limb
Add

Alt.	28	29	30
°	′	′	′
0			
	15.9	14.9	14.2
4			
	15.9	14.9	14.2
8			
	15.9	14.9	14.2
12			
	15.9	14.9	14.2
16			
	15.9	14.9	14.2
20			
	15.9	15.0	14.2
24			
	15.9	15.0	14.3
28			
	15.9	15.0	14.3
32			
	15.9	15.0	14.3
36			
	15.9	15.0	14.4
40			
	15.9	15.0	14.4
44			
	15.8	15.1	14.5
48			
	15.8	15.1	14.5
52			
	15.8	15.1	14.6
56			
	15.8	15.1	14.7
60			
	15.8	15.2	14.7
64			
	15.8	15.2	14.8
68			
	15.7	15.2	14.9
72			
	15.7	15.3	14.9
76			
	15.7	15.3	15.0
80			
	15.7	15.3	15.1
84			
	15.7	15.4	15.2
88			
	15.6	15.4	15.2
90			

Add to table, back cover

Moon's Upper Limb
Subtract

Alt.	28	29	30
°	′	′	′
0			
	15.3	15.9	16.4
4			
	15.3	15.9	16.3
8			
	15.3	15.9	16.3
12			
	15.3	15.9	16.3
16			
	15.3	15.9	16.3
20			
	15.4	15.9	16.3
24			
	15.4	15.9	16.2
28			
	15.4	15.8	16.2
32			
	15.4	15.8	16.2
36			
	15.4	15.8	16.1
40			
	15.4	15.8	16.1
44			
	15.4	15.8	16.0
48			
	15.4	15.7	16.0
52			
	15.5	15.7	15.9
56			
	15.5	15.7	15.8
60			
	15.5	15.6	15.8
64			
	15.5	15.6	15.7
68			
	15.5	15.6	15.6
72			
	15.5	15.6	15.6
76			
	15.6	15.5	15.5
80			
	15.6	15.5	15.4
84			
	15.6	15.4	15.3
88			
	15.6	15.4	15.3
90			

Subtract from table, back cover

GCT	Equation of Time (App.—Mean) 28	29	30
h	m s	m s	m s
0	+ 3 00.1	+ 2 53.0	+ 2 45.4
6	+ 2 58.3	+ 2 51.1	+ 2 43.5
12	+ 2 56.6	+ 2 49.3	+ 2 41.5
18	+ 2 54.8	+ 2 47.4	+ 2 39.5
24	+ 2 53.0	+ 2 45.4	+ 2 37.4

GCT of Transit Meridian of Greenwich

DAY	Moon	Venus	Mars	Jupiter	Saturn
	h m	h m	h m	h m	h m
28	6 32	15 05	11 51	8 09	19 25
29	7 16	15 06	11 50	8 06	19 21
30	7 58	15 07	11 49	8 03	19 18
31	8 40	15 08	11 48	7 59	19 14

Memorial Day 30

GCT	♈ GHA	VENUS −3.7 GHA	VENUS Dec.	MARS 1.6 GHA	MARS Dec.	JUPITER −1.8 GHA	JUPITER Dec.	SATURN 1.2 GHA	SATURN Dec.	MOON GHA	code	Dec.	code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
0	247 41.1	133 12.4	+24 03.9	182 59.5	+21 43.2	239 55.0	+ 2 04.4	70 49.3	+ 3 58.3	233 38.4	153	+ 8 49.0	+142
1	262 43.6	148 11.9	03.5	198 00.1	43.5	254 57.1	04.6	85 51.7	58.3	248 12.7	153	9 03.2	+141
2	277 46.0	163 11.4	03.0	213 00.7	43.8	269 59.1	04.7	100 54.2	58.3	262 47.0	154	9 17.3	+140
3	292 48.5	178 11.0	·· 02.6	228 01.4	·· 44.2	285 01.2	·· 04.9	115 56.7	·· 58.3	277 21.4	153	· 9 31.3	+140
4	307 50.9	193 10.5	02.1	243 02.0	44.5	300 03.3	05.0	130 59.1	58.3	291 55.7	152	9 45.3	+140
5	322 53.4	208 10.0	01.6	258 02.6	44.8	315 05.3	05.2	146 01.6	58.3	306 29.9	153	9 59.3	+139
6	337 55.9	223 09.6	+24 01.1	273 03.2	+21 45.1	330 07.4	+ 2 05.4	161 04.0	+ 3 58.2	321 04.2	152	+10 13.2	+139
7	352 58.3	238 09.1	00.7	288 03.8	45.5	345 09.5	05.5	176 06.5	58.2	335 38.4	152	10 27.1	+138
8	8 00.8	253 08.7	24 00.2	303 04.4	45.8	0 11.5	05.7	191 08.9	58.2	350 12.6	152	10 40.9	+138
9	23 03.3	268 08.2	·23 59.7	318 05.0	·· 46.1	15 13.6	·· 05.9	206 11.4	·· 58.2	4 46.8	152	·10 54.7	+137
10	38 05.7	283 07.7	59.3	333 05.6	46.4	30 15.6	06.0	221 13.9	58.2	19 21.0	151	11 08.4	+136
11	53 08.2	298 07.3	58.8	348 06.2	46.7	45 17.7	06.2	236 16.3	58.2	33 55.1	151	11 22.0	+136
12	68 10.7	313 06.8	+23 58.3	3 06.8	+21 47.1	60 19.8	+ 2 06.3	251 18.8	+ 3 58.2	48 29.2	151	+11 35.6	+136
13	83 13.1	328 06.4	57.8	18 07.4	47.4	75 21.8	06.5	266 21.2	58.2	63 03.3	151	11 49.2	+134
14	98 15.6	343 05.9	57.4	33 08.0	47.7	90 23.9	06.7	281 23.7	58.1	77 37.4	150	12 02.6	+135
15	113 18.1	358 05.5	·· 56.9	48 08.6	·· 48.0	105 26.0	·· 06.8	296 26.2	·· 58.1	92 11.4	150	·12 16.1	+133
16	128 20.5	13 05.0	56.4	63 09.2	48.3	120 28.0	07.0	311 28.6	58.1	106 45.4	150	12 29.4	+134
17	143 23.0	28 04.6	55.9	78 09.8	48.6	135 30.1	07.1	326 31.1	58.1	121 19.4	149	12 42.8	+132
18	158 25.4	43 04.1	+23 55.4	93 10.4	+21 49.0	150 32.2	+ 2 07.3	341 33.5	+ 3 58.1	135 53.3	149	+12 56.0	+132
19	173 27.9	58 03.7	55.0	108 11.1	49.3	165 34.2	07.5	356 36.0	58.1	150 27.2	149	13 09.2	+131
20	188 30.4	73 03.2	54.5	123 11.7	49.6	180 36.3	07.6	11 38.4	58.1	165 01.1	148	13 22.3	+131
21	203 32.8	88 02.8	·· 54.0	138 12.3	·· 49.9	195 38.4	·· 07.8	26 40.9	·· 58.1	179 34.9	148	·13 35.4	+130
22	218 35.3	103 02.3	53.5	153 12.9	50.2	210 40.4	08.0	41 43.4	58.0	194 08.7	148	13 48.4	+130
23	233 37.8	118 01.9	53.0	168 13.5	50.5	225 42.5	08.1	56 45.8	58.0	208 42.5	147	14 01.4	+128
0	248 40.2	133 01.4	+23 52.5	183 14.1	+21 50.9	240 44.6	+ 2 08.3	71 48.3	+ 3 58.0	223 16.2	147	+14 14.2	+128
1	263 42.7	148 01.0	52.1	198 14.7	51.2	255 46.6	08.4	86 50.7	58.0	237 49.9	146	14 27.0	+128
2	278 45.2	163 00.5	51.6	213 15.3	51.5	270 48.7	08.6	101 53.2	58.0	252 23.5	147	14 39.8	+127
3	293 47.6	178 00.1	·· 51.1	228 15.9	·· 51.8	285 50.8	·· 08.8	116 55.6	·· 58.0	266 57.2	145	·14 52.5	+126
4	308 50.1	192 59.6	50.6	243 16.5	52.1	300 52.8	08.9	131 58.1	58.0	281 30.7	146	15 05.1	+125
5	323 52.6	207 59.2	50.1	258 17.1	52.4	315 54.9	09.1	147 00.6	58.0	296 04.3	145	15 17.6	+125
6	338 55.0	222 58.7	+23 49.6	273 17.7	+21 52.7	330 57.0	+ 2 09.2	162 03.0	+ 3 57.9	310 37.8	144	+15 30.1	+124
7	353 57.5	237 58.3	49.1	288 18.3	53.0	345 59.0	09.4	177 05.5	57.9	325 11.2	144	15 42.5	+123
8	8 59.9	252 57.9	48.6	303 18.9	53.4	1 01.1	09.6	192 07.9	57.9	339 44.6	144	15 54.8	+123
9	24 02.4	267 57.4	·· 48.1	318 19.5	·· 53.7	16 03.2	·· 09.7	207 10.4	·· 57.9	354 18.0	143	·16 07.1	+122
10	39 04.9	282 57.0	47.6	333 20.1	54.0	31 05.2	09.9	222 12.8	57.9	8 51.3	143	16 19.3	+121
11	54 07.3	297 56.5	47.1	348 20.7	54.3	46 07.3	10.0	237 15.3	57.9	23 24.6	142	16 31.4	+120
12	69 09.8	312 56.1	+23 46.6	3 21.3	+21 54.6	61 09.4	+ 2 10.2	252 17.7	+ 3 57.9	37 57.8	142	+16 43.4	+120
13	84 12.3	327 55.7	46.1	18 22.0	54.9	76 11.4	10.4	267 20.2	57.8	52 31.0	142	16 55.4	+119
14	99 14.7	342 55.2	45.6	33 22.6	55.2	91 13.5	10.5	282 22.6	57.8	67 04.2	141	17 07.3	+118
15	114 17.2	357 54.8	·· 45.1	48 23.2	·· 55.5	106 15.6	·· 10.7	297 25.1	·· 57.8	81 37.3	140	·17 19.1	+117
16	129 19.7	12 54.4	44.6	63 23.8	55.8	121 17.7	10.8	312 27.6	57.8	96 10.3	140	17 30.8	+117
17	144 22.1	27 53.9	44.1	78 24.4	56.2	136 19.7	11.0	327 30.0	57.8	110 43.3	140	17 42.5	+116
18	159 24.6	42 53.5	+23 43.6	93 25.0	+21 56.5	151 21.8	+ 2 11.2	342 32.5	+ 3 57.8	125 16.3	139	+17 54.1	+114
19	174 27.0	57 53.1	43.1	108 25.6	56.8	166 23.9	11.3	357 34.9	57.8	139 49.2	138	18 05.5	+115
20	189 29.5	72 52.6	42.6	123 26.2	57.1	181 25.9	11.5	12 37.4	57.7	154 22.0	138	18 17.0	+113
21	204 32.0	87 52.2	·· 42.1	138 26.8	·· 57.4	196 28.0	·· 11.6	27 39.8	·· 57.7	168 54.8	138	·18 28.3	+112
22	219 34.4	102 51.8	41.6	153 27.4	57.7	211 30.1	11.8	42 42.3	57.7	183 27.6	137	18 39.5	+112
23	234 36.9	117 51.3	41.1	168 28.0	58.0	226 32.2	12.0	57 44.7	57.7	198 00.3	136	18 50.7	+111
0	249 39.4	132 50.9	+23 40.6	183 28.6	+21 58.3	241 34.2	+ 2 12.1	72 47.2	+ 3 57.7	212 32.9	136	+19 01.8	+110
1	264 41.8	147 50.5	40.1	198 29.2	58.6	256 36.3	12.3	87 49.6	57.7	227 05.5	135	19 12.8	+109
2	279 44.3	162 50.1	39.6	213 29.8	58.9	271 38.4	12.4	102 52.1	57.7	241 38.0	135	19 23.7	+108
3	294 46.8	177 49.6	·· 39.0	228 30.4	·· 59.2	286 40.4	·· 12.6	117 54.5	·· 57.6	256 10.5	135	·19 34.5	+107
4	309 49.2	192 49.2	38.5	243 31.0	59.5	301 42.5	12.8	132 57.0	57.6	270 43.0	134	19 45.2	+107
5	324 51.7	207 48.8	38.0	258 31.6	21 59.8	316 44.6	12.9	147 59.4	57.6	285 15.4	133	19 55.9	+105
6	339 54.2	222 48.4	+23 37.5	273 32.2	+22 00.1	331 46.7	+ 2 13.1	163 01.9	+ 3 57.6	299 47.7	133	+20 06.4	+105
7	354 56.6	237 47.9	37.0	288 32.8	00.4	346 48.7	13.2	178 04.3	57.6	314 20.0	132	20 16.9	+104
8	9 59.1	252 47.5	36.5	303 33.4	00.7	1 50.8	13.4	193 06.8	57.6	328 52.2	131	20 27.3	+102
9	25 01.5	267 47.1	·· 36.0	318 34.0	·· 01.0	16 52.9	·· 13.5	208 09.2	·· 57.6	343 24.3	132	·20 37.5	+102
10	40 04.0	282 46.7	35.4	333 34.7	01.3	31 54.9	13.7	223 11.7	57.5	357 56.5	130	20 47.7	+101
11	55 06.5	297 46.3	34.9	348 35.3	01.6	46 57.0	13.9	238 14.1	57.5	12 28.5	130	20 57.8	+100
12	70 08.9	312 45.8	+23 34.4	3 35.9	+22 01.9	61 59.1	+ 2 14.0	253 16.6	+ 3 57.5	27 00.5	130	+21 07.8	+ 99
13	85 11.4	327 45.4	33.9	18 36.5	02.2	77 01.2	14.2	268 19.0	57.5	41 32.5	128	21 17.7	+ 98
14	100 13.9	342 45.0	33.3	33 37.1	02.5	92 03.2	14.3	283 21.5	57.5	56 04.3	129	21 27.5	+ 97
15	115 16.3	357 44.6	·· 32.8	48 37.7	·· 02.8	107 05.3	·· 14.5	298 23.9	·· 57.5	70 36.2	128	·21 37.2	+ 96
16	130 18.8	12 44.2	32.3	63 38.3	03.2	122 07.4	14.7	313 26.4	57.4	85 08.0	127	21 46.8	+ 96
17	145 21.3	27 43.8	31.8	78 38.9	03.4	137 09.5	14.8	328 28.8	57.4	99 39.7	126	21 56.4	+ 94
18	160 23.7	42 43.3	+23 31.2	93 39.5	+22 03.7	152 11.5	+ 2 15.0	343 31.3	+ 3 57.4	114 11.3	127	+22 05.8	+ 93
19	175 26.2	57 42.9	30.7	108 40.1	04.0	167 13.6	15.1	358 33.7	57.4	128 43.0	125	22 15.1	+ 92
20	190 28.7	72 42.5	30.2	123 40.7	04.3	182 15.7	15.3	13 36.2	57.4	143 14.5	125	22 24.3	+ 91
21	205 31.1	87 42.1	·· 29.7	138 41.3	·· 04.6	197 17.8	·· 15.4	28 38.6	·· 57.4	157 46.0	124	·22 33.4	+ 90
22	220 33.6	102 41.7	29.1	153 41.9	04.9	212 19.8	15.6	43 41.1	57.4	172 17.4	124	22 42.4	+ 89
23	235 36.0	117 41.3	28.6	168 42.5	05.2	227 21.9	15.8	58 43.5	57.3	186 48.8	123	22 51.3	+ 88
24	250 38.5	132 40.9	+23 28.1	183 43.1	+22 05.5	242 24.0	+ 2 15.9	73 46.0	+ 3 57.3	201 20.1	123	+23 00.1	+ 87
code	—	− 4	− 5	+ 7	+ 3	+ 20	+ 2	+ 25	− 1				

GCT	SUN GHA	SUN Dec.
h	° ′	° ′
0	180 39.3	+21 46.1
1	195 39.2	46.5
2	210 39.1	46.9
3	225 39.0	·· 47.2
4	240 39.0	47.6
5	255 38.9	48.0
6	270 38.8	+21 48.4
7	285 38.7	48.7
8	300 38.6	49.1
9	315 38.5	·· 49.5
10	330 38.4	49.8
11	345 38.4	50.2
12	0 38.3	+21 50.6
13	15 38.2	50.9
14	30 38.1	51.3
15	45 38.0	·· 51.6
16	60 37.9	52.0
17	75 37.8	52.4
18	90 37.7	+21 52.7
19	105 37.6	53.1
20	120 37.5	53.4
21	135 37.5	·· 53.8
22	150 37.4	54.2
23	165 37.3	54.5
0	180 37.2	+21 54.9
1	195 37.1	55.2
2	210 37.0	55.6
3	225 36.9	·· 55.9
4	240 36.8	56.3
5	255 36.7	56.7
6	270 36.6	+21 57.0
7	285 36.5	57.4
8	300 36.5	57.7
9	315 36.4	·· 58.1
10	330 36.3	58.4
11	345 36.2	58.8
12	0 36.1	+21 59.1
13	15 36.0	59.5
14	30 35.9	21 59.8
15	45 35.8	·22 00.2
16	60 35.7	00.5
17	75 35.6	00.8
18	90 35.5	+22 01.2
19	105 35.4	01.5
20	120 35.3	01.9
21	135 35.2	·· 02.2
22	150 35.1	02.6
23	165 35.1	02.9
0	180 35.0	+22 03.2
1	195 34.9	03.6
2	210 34.8	03.9
3	225 34.7	·· 04.3
4	240 34.6	04.6
5	255 34.5	04.9
6	270 34.4	+22 05.3
7	285 34.3	05.6
8	300 34.2	06.0
9	315 34.1	·· 06.3
10	330 34.0	06.6
11	345 33.9	07.0
12	0 33.8	+22 07.3
13	15 33.7	07.6
14	30 33.6	08.0
15	45 33.5	·· 08.3
16	60 33.4	08.6
17	75 33.3	08.9
18	90 33.2	+22 09.3
19	105 33.1	09.6
20	120 33.0	09.9
21	135 32.9	·· 10.3
22	150 32.8	10.6
23	165 32.7	10.9
24	180 32.6	+22 11.2
code	−	+ 4

STARS No.	SHA	Dec.	Transit Mer. Gr.
	° ′	° ′	h m
1	358 32.1	+28 49.2	7 30
2	358 21.8	+58 52.6	7 31
3	349 42.8	−18 15.1	8 05
4	339 21.3	+59 58.8	8 46
5	336 01.6	−57 28.7	9 00
6	332 54.9	+89 02.0	9 12
7	328 53.8	+23 14.0	9 28
8	315 54.0	−40 29.7	10 20
9	309 47.9	+49 41.4	10 44
10	291 43.4	+16 24.9	11 56
11	281 57.3	− 8 15.3	12 35
12	281 44.0	+45 57.2	12 36
13	279 22.4	+ 6 18.5	12 46
14	279 12.1	+28 34.2	12 46
15	276 34.1	− 1 13.8	12 57
16	271 52.2	+ 7 24.1	13 16
17	264 17.4	−52 40.1	13 46
18	259 15.2	−16 38.8	14 06
19	255 49.6	−28 54.3	14 20
20	245 48.8	+ 5 21.1	15 00
21	244 25.0	+28 08.9	15 05
22	234 37.7	−59 21.3	15 44
23	223 27.2	−43 14.3	16 29
24	221 50.5	−69 31.2	16 35
25	218 42.1	− 8 26.8	16 48
26	208 33.2	+12 12.4	17 28
27	194 48.5	+62 01.1	18 23
28	183 21.1	+14 50.6	19 09
29	174 01.6	−62 50.1	19 46
30	172 53.0	−56 50.8	19 51
31	168 46.8	−59 25.7	20 07
32	167 01.0	+56 13.6	20 14
33	159 29.8	+55 10.8	20 44
34	159 20.3	−10 54.7	20 45
35	153 35.0	+49 33.4	21 08
36	149 02.5	−36 08.2	21 26
37	146 38.0	+19 26.0	21 35
38	140 55.3	−60 38.5	21 58
39	137 16.2	+74 21.3	22 13
40	126 50.1	+26 52.5	22 54
41	120 37.8	−22 29.3	23 19
42	113 23.2	−26 19.7	23 48
43	109 06.5	−68 56.7	0 09
44	103 05.8	−15 40.2	0 33
45	97 24.9	−37 04.4	0 56
46	96 49.4	+12 35.4	0 58
47	91 07.3	+51 29.4	1 21
48	84 45.3	−34 24.7	1 46
49	81 10.2	+38 44.0	2 00
50	76 55.8	−26 21.6	2 17
51	62 53.5	+ 8 44.1	3 13
52	54 32.2	−56 53.5	3 47
53	50 03.2	+45 06.0	4 04
54	34 32.9	+ 9 38.9	5 06
55	28 42.0	−47 11.7	5 30
56	16 15.3	−29 52.7	6 19
57	14 24.9	+14 56.5	6 27

Lat.	Sunrise	Twlt. begins	Moonrise 31	Moonrise 1	Moonrise 2	Moonrise 3
N °	h m	h m	h m	h m	h m	h m
70	▭	▭	0 45	{0 12 / 23 12}	▭	▭
68	▭	▭	0 56	{0 32 / 23 58}	▭	▭
66	1 15	////	1 04	0 49	{0 28 / 23 49}	▭
64	2 00	////	1 12	1 02	0 51	{0 34 / 23 47}
62	2 28	////	1 18	1 14	1 09	1 04
60	2 50	////	1 24	1 24	1 24	1 27
58	3 08	////	1 29	1 32	1 37	1 45
56	3 23	////	1 33	1 40	1 48	2 01
54	3 35	////	1 37	1 47	1 58	2 14
52	3 47	////	1 41	1 53	2 07	2 26
50	3 56	0 13	1 44	1 59	2 15	2 36
45	4 17	1 55	1 52	2 11	2 32	2 58
40	4 34	2 36	1 58	2 21	2 46	3 16
35	4 47	3 04	2 03	2 29	2 58	3 31
30	5 00	3 26	2 08	2 37	3 09	3 44
20	5 20	3 57	2 16	2 50	3 27	4 07
10	5 38	4 21	2 23	3 02	3 43	4 26
0	5 54	4 40	2 30	3 13	3 57	4 44
10	6 10	4 55	2 37	3 24	4 12	5 03
20	6 28	5 09	2 45	3 36	4 29	5 22
30	6 47	5 22	2 53	3 50	4 47	5 45
35	6 59	5 28	2 58	3 58	4 58	5 59
40	7 12	5 35	3 04	4 07	5 11	6 15
45	7 27	5 41	3 10	4 18	5 26	6 33
50	7 46	5 48	3 18	4 31	5 44	6 57
52	7 55	5 51	3 22	4 37	5 53	7 08
54	8 05	5 54	3 26	4 44	6 03	7 21
56	8 17	5 57	3 31	4 52	6 14	7 36
58	8 30	6 00	3 36	5 00	6 27	7 54
60	8 45	6 04	3 42	5 10	6 42	8 16
S						

Lat.	Sunset	Twlt. ends	Moonset 31	Moonset 1	Moonset 2	Moonset 3
N °	h m	h m	h m	h m	h m	h m
70	▭	▭	17 29	20 00	▭	▭
68	▭	▭	17 10	19 16	▭	▭
66	22 44	////	16 55	18 47	21 02	▭
64	21 58	////	16 43	18 25	20 18	22 45
62	21 29	////	16 32	18 08	19 48	21 34
60	21 06	////	16 24	17 54	19 26	20 59
58	20 48	////	16 16	17 42	19 08	20 34
56	20 34	////	16 09	17 31	18 53	20 14
54	20 21	////	16 03	17 22	18 40	19 57
52	20 09	////	15 58	17 14	18 29	19 43
50	20 00	////	15 53	17 06	18 19	19 30
45	19 39	22 03	15 43	16 51	17 58	19 05
40	19 22	21 21	15 34	16 38	17 42	18 45
35	19 08	20 52	15 27	16 27	17 27	18 28
30	18 56	20 31	15 20	16 18	17 15	18 13
20	18 35	19 58	15 09	16 01	16 54	17 49
10	18 18	19 35	15 00	15 47	16 36	17 27
0	18 01	19 15	14 51	15 34	16 20	17 08
10	17 45	19 00	14 42	15 21	16 03	16 48
20	17 28	18 46	14 32	15 07	15 45	16 27
30	17 08	18 33	14 21	14 51	15 25	16 03
35	16 57	18 27	14 15	14 42	15 13	15 48
40	16 43	18 19	14 08	14 32	14 59	15 32
45	16 28	18 13	14 00	14 20	14 43	15 12
50	16 09	18 06	13 50	14 05	14 24	14 48
52	16 00	18 03	13 45	13 58	14 14	14 36
54	15 50	18 00	13 40	13 50	14 04	14 23
56	15 38	17 57	13 35	13 42	13 52	14 07
58	15 25	17 53	13 29	13 33	13 39	13 49
60	15 10	17 50	13 22	13 22	13 23	13 27
S						

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb	Venus	Mars
°	′	′	′
0			
	0.1	0.2	0.1
30			
	0.1	0.1	0.0
45			
	0.1	0.1	0.0
60			
	0.1	0.1	0.0
75			
	0.1	0.0	0.0
90			

Moon's Lower Limb
Add

Alt.	31	1	2
°	′	′	′
0			
	13.4	12.9	12.4
4			
	13.4	12.9	12.4
8			
	13.4	12.9	12.4
12			
	13.4	12.9	12.4
16			
	13.5	13.0	12.5
20			
	13.5	13.0	12.6
24			
	13.6	13.1	12.6
28			
	13.6	13.2	12.7
32			
	13.7	13.2	12.8
36			
	13.7	13.3	12.9
40			
	13.8	13.4	13.0
44			
	13.9	13.5	13.1
48			
	14.0	13.6	13.3
52			
	14.1	13.7	13.4
56			
	14.2	13.9	13.5
60			
	14.3	14.0	13.7
64			
	14.4	14.1	13.9
68			
	14.5	14.3	14.0
72			
	14.6	14.4	14.2
76			
	14.7	14.5	14.4
80			
	14.9	14.7	14.5
84			
	15.0	14.8	14.7
88			
	15.1	14.9	14.8
90			

Add to table, back cover

Moon's Upper Limb
Subtract

Alt.	31	1	2
°	′	′	′
0			
	16.8	17.1	17.4
4			
	16.8	17.1	17.4
8			
	16.8	17.0	17.3
12			
	16.7	17.0	17.3
16			
	16.7	17.0	17.2
20			
	16.7	16.9	17.2
24			
	16.6	16.9	17.1
28			
	16.6	16.8	17.0
32			
	16.5	16.7	16.9
36			
	16.4	16.6	16.8
40			
	16.4	16.5	16.7
44			
	16.3	16.4	16.6
48			
	16.2	16.3	16.5
52			
	16.1	16.2	16.3
56			
	16.0	16.1	16.2
60			
	15.9	16.0	16.0
64			
	15.8	15.8	15.9
68			
	15.7	15.7	15.7
72			
	15.6	15.6	15.6
76			
	15.4	15.4	15.4
80			
	15.3	15.3	15.2
84			
	15.2	15.1	15.0
88			
	15.1	15.0	14.9
90			

Subtract from table, back cover

Equation of Time (App.—Mean)

GCT	31	1	2
h	m s	m s	m s
0	+ 2 37.4	+ 2 28.9	+ 2 20.0
6	+ 2 35.3	+ 2 26.7	+ 2 17.7
12	+ 2 33.2	+ 2 24.5	+ 2 15.4
18	+ 2 31.1	+ 2 22.3	+ 2 13.1
24	+ 2 28.9	+ 2 20.0	+ 2 10.7

GCT of Transit Meridian of Greenwich

DAY	Moon	Venus	Mars	Jupiter	Saturn
	h m	h m	h m	h m	h m
31	8 40	15 08	11 48	7 59	19 14
1	9 24	15 08	11 47	7 56	19 10
2	10 09	15 09	11 46	7 53	19 06
3	10 56	15 10	11 45	7 49	19 02

GCT	♈ GHA	VENUS −3.8 GHA	VENUS Dec.	MARS 1.6 GHA	MARS Dec.	JUPITER −1.8 GHA	JUPITER Dec.	SATURN 1.2 GHA	SATURN Dec.	MOON GHA	code	MOON Dec.	code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
0	250 38.5	132 40.9	+23 28.1	183 43.1	+22 05.5	242 24.0	+ 2 15.9	73 46.0	+ 3 57.3	201 20.1	123	+23 00.1	+ 87
1	265 41.0	147 40.5	27.5	198 43.7	05.8	257 26.1	16.1	88 48.4	57.3	215 51.4	122	23 08.8	+ 86
2	280 43.4	162 40.1	27.0	213 44.3	06.1	272 28.1	16.2	103 50.9	57.3	230 22.6	122	23 17.4	+ 85
3	295 45.9	177 39.7	·· 26.5	228 44.9	·· 06.4	287 30.2	·· 16.4	118 53.3	·· 57.3	244 53.8	121	·23 25.9	+ 83
4	310 48.4	192 39.3	25.9	243 45.5	06.7	302 32.3	16.5	133 55.8	57.3	259 24.9	120	23 34.2	+ 83
5	325 50.8	207 38.9	25.4	258 46.1	07.0	317 34.4	16.7	148 58.2	57.2	273 55.9	120	23 42.5	+ 82
6	340 53.3	222 38.4	+23 24.9	273 46.7	+22 07.3	332 36.4	+ 2 16.9	164 00.7	+ 3 57.2	288 26.9	120	+23 50.7	+ 80
7	355 55.8	237 38.0	24.3	288 47.3	07.6	347 38.5	17.0	179 03.1	57.2	302 57.9	118	23 58.7	+ 79
8	10 58.2	252 37.6	23.8	303 47.9	07.9	2 40.6	17.2	194 05.6	57.2	317 28.7	119	24 06.6	+ 79
9	26 00.7	267 37.2	·· 23.2	318 48.5	·· 08.2	17 42.7	·· 17.3	209 08.0	·· 57.2	331 59.6	117	·24 14.5	+ 77
10	41 03.1	282 36.8	22.7	333 49.1	08.5	32 44.7	17.5	224 10.5	57.1	346 30.3	118	24 22.2	+ 76
11	56 05.6	297 36.4	22.1	348 49.7	08.8	47 46.8	17.6	239 12.9	57.1	1 01.1	116	24 29.8	+ 75
12	71 08.1	312 36.0	+23 21.6	3 50.4	+22 09.1	62 48.9	+ 2 17.8	254 15.4	+ 3 57.1	15 31.7	116	+24 37.3	+ 73
13	86 10.5	327 35.6	21.1	18 51.0	09.4	77 51.0	18.0	269 17.8	57.1	30 02.3	116	24 44.6	+ 73
14	101 13.0	342 35.2	20.5	33 51.6	09.7	92 53.1	18.1	284 20.3	57.1	44 32.9	115	24 51.9	+ 71
15	116 15.5	357 34.9	·· 20.0	48 52.2	·· 10.0	107 55.1	·· 18.3	299 22.7	·· 57.1	59 03.4	115	·24 59.0	+ 70
16	131 17.9	12 34.5	19.4	63 52.8	10.2	122 57.2	18.4	314 25.1	57.0	73 33.9	114	25 06.0	+ 70
17	146 20.4	27 34.1	18.9	78 53.4	10.5	137 59.3	18.6	329 27.6	57.0	88 04.3	113	25 13.0	+ 67
18	161 22.9	42 33.7	+23 18.3	93 54.0	+22 10.8	153 01.4	+ 2 18.7	344 30.0	+ 3 57.0	102 34.6	113	+25 19.7	+ 67
19	176 25.3	57 33.3	17.8	108 54.6	11.1	168 03.4	18.9	359 32.5	57.0	117 04.9	113	25 26.4	+ 66
20	191 27.8	72 32.9	17.2	123 55.2	11.4	183 05.5	19.0	14 34.9	57.0	131 35.2	112	25 33.0	+ 64
21	206 30.3	87 32.5	·· 16.7	138 55.8	·· 11.7	198 07.6	·· 19.2	29 37.4	·· 57.0	146 05.4	111	·25 39.4	+ 63
22	221 32.7	102 32.1	16.1	153 56.4	12.0	213 09.7	19.4	44 39.8	56.9	160 35.5	111	25 45.7	+ 62
23	236 35.2	117 31.7	15.6	168 57.0	12.3	228 11.8	19.5	59 42.3	56.9	175 05.6	111	25 51.9	+ 61
0	251 37.6	132 31.3	+23 15.0	183 57.6	+22 12.6	243 13.8	+ 2 19.7	74 44.7	+ 3 56.9	189 35.7	110	+25 58.0	+ 59
1	266 40.1	147 30.9	14.5	198 58.2	12.9	258 15.9	19.8	89 47.1	56.9	204 05.7	110	26 03.9	+ 58
2	281 42.6	162 30.5	13.9	213 58.8	13.1	273 18.0	20.0	104 49.6	56.9	218 35.7	109	26 09.7	+ 57
3	296 45.0	177 30.2	·· 13.3	228 59.4	·· 13.4	288 20.1	·· 20.1	119 52.0	·· 56.8	233 05.6	109	·26 15.4	+ 56
4	311 47.5	192 29.8	12.8	244 00.0	13.7	303 22.2	20.3	134 54.5	56.8	247 35.5	108	26 21.0	+ 54
5	326 50.0	207 29.4	12.2	259 00.6	14.0	318 24.2	20.4	149 56.9	56.8	262 05.3	108	26 26.4	+ 54
6	341 52.4	222 29.0	+23 11.7	274 01.2	+22 14.3	333 26.3	+ 2 20.6	164 59.4	+ 3 56.8	276 35.1	107	+26 31.8	+ 52
7	356 54.9	237 28.6	11.1	289 01.8	14.6	348 28.4	20.7	180 01.8	56.8	291 04.8	107	26 37.0	+ 50
8	11 57.4	252 28.2	10.5	304 02.4	14.9	3 30.5	20.9	195 04.3	56.8	305 34.5	107	26 42.0	+ 50
9	26 59.8	267 27.9	·· 10.0	319 03.0	·· 15.2	18 32.6	·· 21.1	210 06.7	·· 56.7	320 04.2	106	·26 47.0	+ 48
10	42 02.3	282 27.5	09.4	334 03.6	15.4	33 34.6	21.2	225 09.1	56.7	334 33.8	106	26 51.8	+ 47
11	57 04.8	297 27.1	08.9	349 04.2	15.7	48 36.7	21.4	240 11.6	56.7	349 03.4	105	26 56.5	+ 46
12	72 07.2	312 26.7	+23 08.3	4 04.8	+22 16.0	63 38.8	+ 2 21.5	255 14.0	+ 3 56.7	3 32.9	106	+27 01.1	+ 44
13	87 09.7	327 26.3	07.7	19 05.4	16.3	78 40.9	21.7	270 16.5	56.7	18 02.5	104	27 05.5	+ 43
14	102 12.1	342 26.0	07.2	34 06.0	16.6	93 43.0	21.8	285 18.9	56.6	32 31.9	105	27 09.8	+ 42
15	117 14.6	357 25.6	·· 06.6	49 06.6	·· 16.9	108 45.1	·· 22.0	300 21.4	·· 56.6	47 01.4	104	·27 14.0	+ 40
16	132 17.1	12 25.2	06.0	64 07.2	17.1	123 47.1	22.1	315 23.8	56.6	61 30.8	103	27 18.0	+ 39
17	147 19.5	27 24.8	05.5	79 07.8	17.4	138 49.2	22.3	330 26.2	56.6	76 00.1	104	27 21.9	+ 38
18	162 22.0	42 24.5	+23 04.9	94 08.4	+22 17.7	153 51.3	+ 2 22.4	345 28.7	+ 3 56.6	90 29.5	103	+27 25.7	+ 36
19	177 24.5	57 24.1	04.3	109 09.0	18.0	168 53.4	22.6	0 31.1	56.5	104 58.8	103	27 29.3	+ 35
20	192 26.9	72 23.7	03.7	124 09.6	18.3	183 55.5	22.8	15 33.6	56.5	119 28.1	102	27 32.8	+ 34
21	207 29.4	87 23.4	·· 03.2	139 10.2	·· 18.5	198 57.5	·· 22.9	30 36.0	·· 56.5	133 57.3	102	·27 36.2	+ 33
22	222 31.9	102 23.0	02.6	154 10.8	18.8	213 59.6	23.1	45 38.4	56.5	148 26.5	102	27 39.5	+ 31
23	237 34.3	117 22.6	02.0	169 11.4	19.1	229 01.7	23.2	60 40.9	56.5	162 55.7	102	27 42.6	+ 30
0	252 36.8	132 22.3	+23 01.4	184 12.0	+22 19.4	244 03.8	+ 2 23.4	75 43.3	+ 3 56.4	177 24.9	101	+27 45.6	+ 28
1	267 39.3	147 21.9	00.9	199 12.6	19.7	259 05.9	23.5	90 45.8	56.4	191 54.0	102	27 48.4	+ 27
2	282 41.7	162 21.5	23 00.3	214 13.2	19.9	274 08.0	23.7	105 48.2	56.4	206 23.2	100	27 51.1	+ 26
3	297 44.2	177 21.2	·22 59.7	229 13.9	·· 20.2	289 10.1	·· 23.8	120 50.6	·· 56.4	220 52.2	101	·27 53.7	+ 25
4	312 46.6	192 20.8	59.1	244 14.5	20.5	304 12.1	24.0	135 53.1	56.4	235 21.3	101	27 56.2	+ 23
5	327 49.1	207 20.4	58.5	259 15.1	20.8	319 14.2	24.1	150 55.5	56.3	249 50.4	100	27 58.5	+ 22
6	342 51.6	222 20.1	+22 58.0	274 15.7	+22 21.1	334 16.3	+ 2 24.3	165 58.0	+ 3 56.3	264 19.4	100	+28 00.7	+ 20
7	357 54.0	237 19.7	57.4	289 16.3	21.3	349 18.4	24.4	181 00.4	56.3	278 48.4	100	28 02.7	+ 19
8	12 56.5	252 19.3	56.8	304 16.9	21.6	4 20.5	24.6	196 02.8	56.3	293 17.4	100	28 04.6	+ 18
9	27 59.0	267 19.0	·· 56.2	319 17.5	·· 21.9	19 22.6	·· 24.7	211 05.3	·· 56.3	307 46.4	100	·28 06.4	+ 16
10	43 01.4	282 18.6	55.6	334 18.1	22.2	34 24.6	24.9	226 07.7	56.2	322 15.4	100	28 08.0	+ 15
11	58 03.9	297 18.3	55.0	349 18.7	22.4	49 26.7	25.0	241 10.2	56.2	336 44.4	99	28 09.5	+ 13
12	73 06.4	312 17.9	+22 54.5	4 19.3	+22 22.7	64 28.8	+ 2 25.2	256 12.6	+ 3 56.2	351 13.3	100	+28 10.8	+ 13
13	88 08.8	327 17.5	53.9	19 19.9	23.0	79 30.9	25.3	271 15.0	56.2	5 42.3	99	28 12.1	+ 11
14	103 11.3	342 17.2	53.3	34 20.5	23.3	94 33.0	25.5	286 17.5	56.2	20 11.2	99	28 13.2	+ 9
15	118 13.8	357 16.8	·· 52.7	49 21.1	·· 23.5	109 35.1	·· 25.6	301 19.9	·· 56.1	34 40.1	99	·28 14.1	+ 8
16	133 16.2	12 16.5	52.1	64 21.7	23.8	124 37.2	25.8	316 22.4	56.1	49 09.0	100	28 14.9	+ 7
17	148 18.7	27 16.1	51.5	79 22.3	24.1	139 39.3	26.0	331 24.8	56.1	63 38.0	99	28 15.6	+ 5
18	163 21.1	42 15.8	+22 50.9	94 22.9	+22 24.4	154 41.3	+ 2 26.1	346 27.2	+ 3 56.1	78 06.9	99	+28 16.1	+ 4
19	178 23.6	57 15.4	50.3	109 23.5	24.6	169 43.4	26.3	1 29.7	56.1	92 35.8	99	28 16.5	+ 3
20	193 26.1	72 15.1	49.7	124 24.1	24.9	184 45.5	26.4	16 32.1	56.0	107 04.7	99	28 16.8	+ 1
21	208 28.5	87 14.7	·· 49.1	139 24.7	·· 25.2	199 47.6	·· 26.6	31 34.5	·· 56.0	121 33.6	99	·28 16.9	0
22	223 31.0	102 14.4	48.5	154 25.3	25.5	214 49.7	26.7	46 37.0	56.0	136 02.5	99	28 16.9	− 1
23	238 33.5	117 14.0	47.9	169 25.9	25.7	229 51.8	26.9	61 39.4	56.0	150 31.4	99	28 16.8	− 3
24	253 35.9	132 13.7	+22 47.3	184 26.5	+22 26.0	244 53.9	+ 2 27.0	76 41.9	+ 3 56.0	165 00.3	100	+28 16.5	− 4
code	—	− 4	− 6	+ 6	+ 3	+ 21	+ 2	+ 25	0				

GCT	SUN GHA	SUN Dec.
h	° ′	° ′
0	180 32.6	+22 11.2
1	195 32.5	11.6
2	210 32.4	11.9
3	225 32.3	•• 12.2
4	240 32.2	12.5
5	255 32.1	12.8
6	270 32.0	+22 13.2
7	285 31.9	13.5
8	300 31.8	13.8
9	315 31.7	•• 14.1
10	330 31.6	14.4
11	345 31.5	14.8
12	0 31.4	+22 15.1
13	15 31.3	15.4
14	30 31.2	15.7
15	45 31.1	•• 16.0
16	60 31.0	16.3
17	75 30.9	16.6
18	90 30.8	+22 17.0
19	105 30.7	17.3
20	120 30.6	17.6
21	135 30.5	•• 17.9
22	150 30.4	18.2
23	165 30.3	18.5
0	180 30.2	+22 18.8
1	195 30.1	19.1
2	210 30.0	19.4
3	225 29.9	•• 19.7
4	240 29.8	20.0
5	255 29.7	20.4
6	270 29.6	+22 20.7
7	285 29.5	21.0
8	300 29.4	21.3
9	315 29.3	•• 21.6
10	330 29.2	21.9
11	345 29.1	22.2
12	0 29.0	+22 22.5
13	15 28.8	22.8
14	30 28.7	23.1
15	45 28.6	•• 23.4
16	60 28.5	23.7
17	75 28.4	24.0
18	90 28.3	+22 24.3
19	105 28.2	24.6
20	120 28.1	24.9
21	135 28.0	•• 25.1
22	150 27.9	25.4
23	165 27.8	25.7
0	180 27.7	+22 26.0
1	195 27.6	26.3
2	210 27.5	26.6
3	225 27.4	•• 26.9
4	240 27.3	27.2
5	255 27.1	27.5
6	270 27.0	+22 27.8
7	285 26.9	28.1
8	300 26.8	28.3
9	315 26.7	•• 28.6
10	330 26.6	28.9
11	345 26.5	29.2
12	0 26.4	+22 29.5
13	15 26.3	29.8
14	30 26.2	30.0
15	45 26.1	•• 30.3
16	60 26.0	30.6
17	75 25.8	30.9
18	90 25.7	+22 31.2
19	105 25.6	31.5
20	120 25.5	31.7
21	135 25.4	•• 32.0
22	150 25.3	32.3
23	165 25.2	32.6
24	180 25.1	+22 32.8
code	−	+ 3

STARS No.	SHA	Dec.	Transit Mer. Gr.
	° ′	° ′	h m
1	358 32.1	+28 49.2	7 18
2	358 21.8	+58 52.6	7 19
3	349 42.8	−18 15.1	7 53
4	339 21.3	+59 58.8	8 35
5	336 01.5	−57 28.7	8 48
6	332 54.1	+89 02.0	9 00
7	328 53.8	+23 14.0	9 16
8	315 54.0	−40 29.7	10 08
9	309 47.9	+49 41.4	10 33
10	291 43.3	+16 24.9	11 45
11	281 57.3	− 8 15.3	12 24
12	281 44.0	+45 57.2	12 25
13	279 22.4	+ 6 18.5	12 34
14	279 12.0	+28 34.2	12 35
15	276 34.1	− 1 13.8	12 45
16	271 52.2	+ 7 24.1	13 04
17	264 17.4	−52 40.1	13 34
18	259 15.2	−16 38.8	13 54
19	255 49.6	−28 54.3	14 08
20	245 48.8	+ 5 21.1	14 48
21	244 25.0	+28 08.9	14 53
22	234 37.8	−59 21.3	15 32
23	223 27.2	−43 14.3	16 17
24	221 50.5	−69 31.2	16 23
25	218 42.1	− 8 26.8	16 36
26	208 33.2	+12 12.4	17 16
27	194 48.5	+62 01.1	18 11
28	183 21.1	+14 50.6	18 57
29	174 01.7	−62 50.2	19 34
30	172 53.1	−56 50.8	19 39
31	168 46.9	−59 25.7	19 55
32	167 01.0	+56 13.6	20 02
33	159 29.8	+55 10.8	20 32
34	159 20.3	−10 54.7	20 33
35	153 35.1	+49 33.4	20 56
36	149 02.5	−36 08.2	21 14
37	146 38.0	+19 26.0	21 23
38	140 55.3	−60 38.6	21 46
39	137 16.2	+74 21.3	22 01
40	126 50.1	+26 52.5	22 42
41	120 37.8	−22 29.3	23 07
42	113 23.2	−26 19.7	23 36
43	109 06.5	−68 56.7	23 53
44	103 05.8	−15 40.2	0 21
45	97 24.9	−37 04.4	0 44
46	96 49.4	+12 35.5	0 46
47	91 07.3	+51 29.4	1 09
48	84 45.3	−34 24.7	1 34
49	81 10.2	+38 44.0	1 49
50	76 55.8	−26 21.6	2 05
51	62 53.5	+ 8 44.1	3 01
52	54 32.1	−56 53.5	3 35
53	50 03.2	+45 06.0	3 53
54	34 32.9	+ 9 38.9	4 54
55	28 42.0	−47 11.7	5 18
56	16 15.3	−29 52.7	6 07
57	14 24.9	+14 56.5	6 15

Lat.	Sunrise	Twlt. begins	Moonrise 3	4	5	6
N °	h m	h m	h m	h m	h m	h m
70	□	□	□	□	□	□
68	□	□	□	□	□	□
66	1 02	////	□	□	□	□
64	1 52	////	{0 34 / 23 47}	□	□	□
62	2 23	////	1 04	0 58	0 48	□
60	2 46	////	1 27	1 34	1 51	2 33
58	3 04	////	1 45	2 00	2 25	3 11
56	3 20	////	2 01	2 20	2 51	3 38
54	3 33	////	2 14	2 37	3 11	3 59
52	3 44	////	2 26	2 52	3 28	4 16
50	3 54	////	2 36	3 05	3 42	4 31
45	4 15	1 51	2 58	3 31	4 11	5 01
40	4 32	2 33	3 16	3 52	4 35	5 25
35	4 47	3 02	3 31	4 09	4 54	5 44
30	4 59	3 24	3 44	4 24	5 10	6 01
20	5 20	3 57	4 07	4 50	5 38	6 29
10	5 38	4 21	4 26	5 12	6 02	6 53
0	5 54	4 40	4 44	5 33	6 24	7 15
10	6 11	4 56	5 03	5 54	6 46	7 38
20	6 29	5 10	5 22	6 17	7 10	8 02
30	6 49	5 23	5 45	6 43	7 38	8 30
35	7 00	5 30	5 59	6 58	7 55	8 47
40	7 14	5 36	6 15	7 16	8 14	9 06
45	7 30	5 44	6 33	7 38	8 38	9 29
50	7 49	5 50	6 57	8 06	9 08	10 00
52	7 58	5 53	7 08	8 20	9 23	10 15
54	8 09	5 57	7 21	8 36	9 41	10 32
56	8 20	6 00	7 36	8 54	10 02	10 53
58	8 34	6 04	7 54	9 17	10 29	11 19
60	8 50	6 07	8 16	9 48	11 08	11 56
S						

Lat.	Sunset	Twlt. ends	Moonset 3	4	5	6
N °	h m	h m	h m	h m	h m	h m
70	□	□	□	□	□	□
68	□	□	□	□	□	□
66	22 58	////	□	□	□	□
64	22 06	////	22 45	□	□	□
62	21 35	////	21 34	23 30	□	□
60	21 11	////	20 59	22 27	23 32	24 05
58	20 53	////	20 34	21 53	22 54	23 33
56	20 37	////	20 14	21 28	22 27	23 09
54	20 24	////	19 57	21 08	22 06	22 50
52	20 13	////	19 43	20 51	21 49	22 33
50	20 03	////	19 30	20 37	21 34	22 19
45	19 41	22 07	19 05	20 07	21 03	21 50
40	19 24	21 24	18 45	19 45	20 40	21 28
35	19 10	20 55	18 28	19 26	20 20	21 09
30	18 58	20 33	18 13	19 10	20 04	20 53
20	18 37	20 00	17 49	18 43	19 36	20 26
10	18 19	19 36	17 27	18 19	19 11	20 02
0	18 02	19 17	17 08	17 58	18 49	19 40
10	17 45	19 00	16 48	17 36	18 26	19 18
20	17 28	18 46	16 27	17 13	18 02	18 54
30	17 08	18 33	16 03	16 45	17 34	18 27
35	16 56	18 26	15 48	16 30	17 17	18 10
40	16 42	18 19	15 32	16 11	16 58	17 51
45	16 27	18 13	15 12	15 49	16 34	17 28
50	16 07	18 05	14 48	15 20	16 04	16 58
52	15 58	18 02	14 36	15 06	15 48	16 43
54	15 47	17 58	14 23	14 50	15 31	16 26
56	15 36	17 56	14 07	14 31	15 09	16 05
58	15 22	17 52	13 49	14 08	14 42	15 39
60	15 06	17 48	13 27	13 37	14 04	15 03
S						

GCT	Equation of Time (App.—Mean) 3	4	5
h	m s	m s	m s
0	+ 2 10.7	+ 2 01.0	+ 1 51.0
6	+ 2 08.3	+ 1 58.5	+ 1 48.4
12	+ 2 05.9	+ 1 56.0	+ 1 45.8
18	+ 2 03.5	+ 1 53.5	+ 1 43.2
24	+ 2 01.0	+ 1 51.0	+ 1 40.5

GCT of Transit Meridian of Greenwich

DAY	Moon	Venus	Mars	Jupiter	Saturn
	h m	h m	h m	h m	h m
3	10 56	15 10	11 45	7 49	19 02
4	11 45	15 10	11 44	7 46	18 58
5	12 36	15 11	11 43	7 43	18 54
6	13 28	15 11	11 42	7 39	18 50

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb	Venus	Mars
°	′	′	′
0			
	0.1	0.2	0.1
30			
	0.1	0.1	0.0
45			
	0.1	0.1	0.0
60			
	0.1	0.1	0.0
75			
	0.1	0.0	0.0
90			

Moon's Lower Limb
Add

Alt.	3	4	5
°	′	′	′
0			
	12.0	11.7	11.7
4			
	12.0	11.7	11.7
8			
	12.0	11.8	11.8
12			
	12.1	11.8	11.8
16			
	12.1	11.9	11.9
20			
	12.2	12.0	12.0
24			
	12.3	12.0	12.0
28			
	12.4	12.1	12.1
32			
	12.5	12.2	12.2
36			
	12.6	12.4	12.4
40			
	12.7	12.5	12.5
44			
	12.8	12.6	12.6
48			
	13.0	12.8	12.8
52			
	13.1	13.0	13.0
56			
	13.3	13.1	13.1
60			
	13.5	13.3	13.3
64			
	13.6	13.5	13.5
68			
	13.8	13.7	13.7
72			
	14.0	13.9	13.9
76			
	14.2	14.1	14.1
80			
	14.4	14.3	14.3
84			
	14.6	14.5	14.5
88			
	14.7	14.7	14.7
90			

Add to table, back cover

Moon's Upper Limb
Subtract

Alt.	3	4	5
°	′	′	′
0			
	17.6	17.7	17.7
4			
	17.6	17.7	17.7
8			
	17.5	17.7	17.7
12			
	17.5	17.6	17.6
16			
	17.5	17.6	17.6
20			
	17.4	17.5	17.5
24			
	17.3	17.4	17.4
28			
	17.2	17.3	17.3
32			
	17.1	17.2	17.2
36			
	17.0	17.1	17.1
40			
	16.9	17.0	17.0
44			
	16.7	16.8	16.8
48			
	16.6	16.7	16.7
52			
	16.4	16.5	16.5
56			
	16.3	16.3	16.3
60			
	16.1	16.1	16.1
64			
	15.9	16.0	16.0
68			
	15.7	15.8	15.8
72			
	15.6	15.6	15.6
76			
	15.4	15.4	15.4
80			
	15.2	15.2	15.2
84			
	15.0	14.9	14.9
88			
	14.8	14.8	14.8
90			

Subtract from table, back cover

New Moon 4

G C T	♈	VENUS −3.8		MARS 1.7		JUPITER −1.8		SATURN 1.2		MOON			
	GHA	GHA	Dec.	GHA	Dec.	GHA	Dec.	GHA	Dec.	GHA	code	Dec.	code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
0	253 35.9	132 13.7	+22 47.3	184 26.5	+22 26.0	244 53.9	+ 2 27.0	76 41.9	+ 3 56.0	165 00.3	100	+28 16.5	− 4
1	268 38.4	147 13.3	46.7	199 27.1	26.3	259 56.0	27.2	91 44.3	55.9	179 29.3	99	28 16.1	− 6
2	283 40.9	162 13.0	46.2	214 27.7	26.5	274 58.0	27.3	106 46.7	55.9	193 58.2	99	28 15.5	− 7
3	298 43.3	177 12.6	·· 45.6	229 28.3	·· 26.8	290 00.1	·· 27.5	121 49.2	·· 55.9	208 27.1	100	·28 14.8	− 8
4	313 45.8	192 12.3	44.9	244 28.9	27.1	305 02.2	27.6	136 51.6	55.9	222 56.1	99	28 14.0	− 10
5	328 48.2	207 12.0	44.3	259 29.5	27.3	320 04.3	27.8	151 54.0	55.8	237 25.0	100	28 13.0	− 11
6	343 50.7	222 11.6	+22 43.7	274 30.1	+22 27.6	335 06.4	+ 2 27.9	166 56.5	+ 3 55.8	251 54.0	100	+28 11.9	− 13
7	358 53.2	237 11.3	43.1	289 30.7	27.9	350 08.5	28.1	181 58.9	55.8	266 23.0	100	28 10.6	− 13
8	13 55.6	252 10.9	42.5	304 31.3	28.2	5 10.6	28.2	197 01.3	55.8	280 52.0	100	28 09.3	− 15
9	28 58.1	267 10.6	·· 41.9	319 31.9	·· 28.4	20 12.7	·· 28.4	212 03.8	·· 55.8	295 21.0	100	·28 07.8	− 17
10	44 00.6	282 10.3	41.3	334 32.5	28.7	35 14.8	28.5	227 06.2	55.7	309 50.0	100	28 06.1	− 18
11	59 03.0	297 09.9	40.7	349 33.1	29.0	50 16.8	28.7	242 08.7	55.7	324 19.0	101	28 04.3	− 19
12	74 05.5	312 09.6	+22 40.1	4 33.7	+22 29.2	65 18.9	+ 2 28.8	257 11.1	+ 3 55.7	338 48.1	101	+28 02.4	− 21
13	89 08.0	327 09.3	39.5	19 34.3	29.5	80 21.0	29.0	272 13.5	55.7	353 17.2	101	28 00.3	− 21
14	104 10.4	342 08.9	38.9	34 34.9	29.8	95 23.1	29.1	287 16.0	55.6	7 46.3	101	27 58.2	− 24
15	119 12.9	357 08.6	·· 38.3	49 35.5	·· 30.0	110 25.2	·· 29.3	302 18.4	·· 55.6	22 15.4	102	·27 55.8	− 24
16	134 15.4	12 08.3	37.7	64 36.1	30.3	125 27.3	29.4	317 20.8	55.6	36 44.6	101	27 53.4	− 26
17	149 17.8	27 07.9	37.1	79 36.7	30.6	140 29.4	29.6	332 23.3	55.6	51 13.7	102	27 50.8	− 27
18	164 20.3	42 07.6	+22 36.4	94 37.3	+22 30.8	155 31.5	+ 2 29.7	347 25.7	+ 3 55.6	65 42.9	103	+27 48.1	− 29
19	179 22.7	57 07.3	35.8	109 37.9	31.1	170 33.6	29.9	2 28.1	55.5	80 12.2	102	27 45.2	− 30
20	194 25.2	72 06.9	35.2	124 38.5	31.3	185 35.7	30.0	17 30.6	55.5	94 41.4	103	27 42.2	− 31
21	209 27.7	87 06.6	·· 34.6	139 39.1	·· 31.6	200 37.8	·· 30.2	32 33.0	·· 55.5	109 10.7	103	·27 39.1	− 33
22	224 30.1	102 06.3	34.0	154 39.7	31.9	215 39.9	30.3	47 35.4	55.5	123 40.0	104	27 35.8	− 34
23	239 32.6	117 05.9	33.4	169 40.3	32.1	230 41.9	30.5	62 37.9	55.4	138 09.4	103	27 32.4	− 35
0	254 35.1	132 05.6	+22 32.8	184 40.9	+22 32.4	245 44.0	+ 2 30.6	77 40.3	+ 3 55.4	152 38.7	104	+27 28.9	− 36
1	269 37.5	147 05.3	32.1	199 41.5	32.7	260 46.1	30.8	92 42.7	55.4	167 08.1	105	27 25.3	− 38
2	284 40.0	162 05.0	31.5	214 42.1	32.9	275 48.2	30.9	107 45.2	55.4	181 37.6	105	27 21.5	− 39
3	299 42.5	177 04.6	·· 30.9	229 42.7	·· 33.2	290 50.3	·· 31.1	122 47.6	·· 55.3	196 07.1	105	·27 17.6	− 41
4	314 44.9	192 04.3	30.3	244 43.3	33.4	305 52.4	31.2	137 50.0	55.3	210 36.6	105	27 13.5	− 41
5	329 47.4	207 04.0	29.6	259 43.9	33.7	320 54.5	31.4	152 52.5	55.3	225 06.1	106	27 09.4	− 43
6	344 49.9	222 03.7	+22 29.0	274 44.5	+22 34.0	335 56.6	+ 2 31.5	167 54.9	+ 3 55.3	239 35.7	107	+27 05.1	− 45
7	359 52.3	237 03.4	28.4	289 45.1	34.2	350 58.7	31.7	182 57.3	55.2	254 05.4	106	27 00.6	− 45
8	14 54.8	252 03.0	27.8	304 45.7	34.5	6 00.8	31.8	197 59.7	55.2	268 35.0	107	26 56.1	− 47
9	29 57.2	267 02.7	·· 27.1	319 46.3	·· 34.7	21 02.9	·· 31.9	213 02.2	·· 55.2	283 04.7	108	·26 51.4	− 48
10	44 59.7	282 02.4	26.5	334 46.9	35.0	36 05.0	32.1	228 04.6	55.2	297 34.5	108	26 46.6	− 49
11	60 02.2	297 02.1	25.9	349 47.5	35.3	51 07.1	32.2	243 07.0	55.2	312 04.3	108	26 41.7	− 51
12	75 04.6	312 01.8	+22 25.3	4 48.1	+22 35.5	66 09.2	+ 2 32.4	258 09.5	+ 3 55.1	326 34.1	109	+26 36.6	− 52
13	90 07.1	327 01.5	24.6	19 48.7	35.8	81 11.3	32.5	273 11.9	55.1	341 04.0	109	26 31.4	− 53
14	105 09.6	342 01.2	24.0	34 49.3	36.0	96 13.4	32.7	288 14.3	55.1	355 33.9	110	26 26.1	− 54
15	120 12.0	357 00.8	·· 23.4	49 49.9	·· 36.3	111 15.5	·· 32.8	303 16.8	·· 55.1	10 03.9	110	·26 20.7	− 56
16	135 14.5	12 00.5	22.7	64 50.5	36.5	126 17.6	33.0	318 19.2	55.0	24 33.9	111	26 15.1	− 57
17	150 17.0	27 00.2	22.1	79 51.1	36.8	141 19.6	33.1	333 21.6	55.0	39 04.0	111	26 09.4	− 58
18	165 19.4	41 59.9	+22 21.5	94 51.7	+22 37.1	156 21.7	+ 2 33.3	348 24.1	+ 3 55.0	53 34.1	111	+26 03.6	− 59
19	180 21.9	56 59.6	20.8	109 52.3	37.3	171 23.8	33.4	3 26.5	55.0	68 04.2	112	25 57.7	− 60
20	195 24.4	71 59.3	20.2	124 52.9	37.6	186 25.9	33.6	18 28.9	54.9	82 34.4	113	25 51.7	− 62
21	210 26.8	86 59.0	·· 19.6	139 53.5	·· 37.8	201 28.0	·· 33.7	33 31.3	·· 54.9	97 04.7	113	·25 45.5	− 63
22	225 29.3	101 58.7	18.9	154 54.1	38.1	216 30.1	33.9	48 33.8	54.9	111 35.0	113	25 39.2	− 64
23	240 31.7	116 58.4	18.3	169 54.7	38.3	231 32.2	34.0	63 36.2	54.9	126 05.3	114	25 32.8	− 65
0	255 34.2	131 58.1	+22 17.7	184 55.3	+22 38.6	246 34.3	+ 2 34.2	78 38.6	+ 3 54.8	140 35.7	115	+25 26.3	− 67
1	270 36.7	146 57.8	17.0	199 55.9	38.8	261 36.4	34.3	93 41.1	54.8	155 06.2	115	25 19.6	− 67
2	285 39.1	161 57.5	16.4	214 56.5	39.1	276 38.5	34.5	108 43.5	54.8	169 36.7	116	25 12.9	− 69
3	300 41.6	176 57.2	·· 15.7	229 57.1	·· 39.3	291 40.6	·· 34.6	123 45.9	·· 54.8	184 07.3	116	·25 06.0	− 70
4	315 44.1	191 56.9	15.1	244 57.7	39.6	306 42.7	34.7	138 48.3	54.7	198 37.9	116	24 59.0	− 71
5	330 46.5	206 56.6	14.5	259 58.3	39.8	321 44.8	34.9	153 50.8	54.7	213 08.5	117	24 51.9	− 72
6	345 49.0	221 56.3	+22 13.8	274 58.9	+22 40.1	336 46.9	+ 2 35.0	168 53.2	+ 3 54.7	227 39.2	118	+24 44.7	− 73
7	0 51.5	236 56.0	13.2	289 59.5	40.3	351 49.0	35.2	183 55.6	54.7	242 10.0	118	24 37.4	− 75
8	15 53.9	251 55.7	12.5	305 00.1	40.6	6 51.1	35.3	198 58.1	54.6	256 40.8	119	24 29.9	− 75
9	30 56.4	266 55.4	·· 11.9	320 00.7	·· 40.9	21 53.2	·· 35.5	214 00.5	·· 54.6	271 11.7	119	·24 22.4	− 77
10	45 58.8	281 55.1	11.2	335 01.3	41.1	36 55.3	35.6	229 02.9	54.6	285 42.6	120	24 14.7	− 78
11	61 01.3	296 54.8	10.6	350 01.9	41.3	51 57.4	35.8	244 05.3	54.6	300 13.6	120	24 06.9	− 79
12	76 03.8	311 54.5	+22 09.9	5 02.5	+22 41.6	66 59.5	+ 2 35.9	259 07.8	+ 3 54.5	314 44.6	121	+23 59.0	− 80
13	91 06.2	326 54.2	09.3	20 03.1	41.8	82 01.6	36.1	274 10.2	54.5	329 15.7	122	23 51.0	− 81
14	106 08.7	341 53.9	08.6	35 03.7	42.1	97 03.7	36.2	289 12.6	54.5	343 46.9	122	23 42.9	− 82
15	121 11.2	356 53.6	·· 08.0	50 04.3	·· 42.3	112 05.8	·· 36.4	304 15.1	·· 54.5	358 18.1	122	·23 34.7	− 83
16	136 13.6	11 53.4	07.3	65 04.9	42.6	127 07.9	36.5	319 17.5	54.4	12 49.3	123	23 26.4	− 84
17	151 16.1	26 53.1	06.7	80 05.5	42.8	142 10.0	36.6	334 19.9	54.4	27 20.6	124	23 18.0	− 86
18	166 18.6	41 52.8	+22 06.0	95 06.1	+22 43.1	157 12.1	+ 2 36.8	349 22.3	+ 3 54.4	41 52.0	124	+23 09.4	− 86
19	181 21.0	56 52.5	05.4	110 06.7	43.3	172 14.2	36.9	4 24.8	54.3	56 23.4	125	23 00.8	− 88
20	196 23.5	71 52.2	04.7	125 07.3	43.6	187 16.3	37.1	19 27.2	54.3	70 54.9	125	22 52.0	− 88
21	211 26.0	86 51.9	·· 04.1	140 07.9	·· 43.8	202 18.4	·· 37.2	34 29.6	·· 54.3	85 26.4	126	·22 43.2	− 90
22	226 28.4	101 51.6	03.4	155 08.5	44.1	217 20.5	37.4	49 32.0	54.3	99 58.0	126	22 34.2	− 90
23	241 30.9	116 51.4	02.8	170 09.1	44.3	232 22.6	37.5	64 34.5	54.2	114 29.6	127	22 25.2	− 92
24	256 33.3	131 51.1	+22 02.1	185 09.7	+22 44.6	247 24.7	+ 2 37.7	79 36.9	+ 3 54.2	129 01.3	128	+22 16.0	− 92
code	—	− 3	− 7	+ 6	+ 3	+ 21	+ 1	+ 24	0				

GCT	SUN GHA	SUN Dec.
h	° ′	° ′
0	180 25.1	+22 32.8
1	195 25.0	33.1
2	210 24.9	33.4
3	225 24.7	33.7
4	240 24.6	33.9
5	255 24.5	34.2
6	270 24.4	+22 34.5
7	285 24.3	34.7
8	300 24.2	35.0
9	315 24.1	35.3
10	330 24.0	35.6
11	345 23.9	35.8
12	0 23.7	+22 36.1
13	15 23.6	36.4
14	30 23.5	36.6
15	45 23.4	36.9
16	60 23.3	37.2
17	75 23.2	37.4
18	90 23.1	+22 37.7
19	105 23.0	37.9
20	120 22.8	38.2
21	135 22.7	38.5
22	150 22.6	38.7
23	165 22.5	39.0
0	180 22.4	+22 39.3
1	195 22.3	39.5
2	210 22.2	39.8
3	225 22.0	40.0
4	240 21.9	40.3
5	255 21.8	40.5
6	270 21.7	+22 40.8
7	285 21.6	41.1
8	300 21.5	41.3
9	315 21.4	41.6
10	330 21.2	41.8
11	345 21.1	42.1
12	0 21.0	+22 42.3
13	15 20.9	42.6
14	30 20.8	42.8
15	45 20.7	43.1
16	60 20.6	43.3
17	75 20.4	43.6
18	90 20.3	+22 43.8
19	105 20.2	44.1
20	120 20.1	44.3
21	135 20.0	44.5
22	150 19.9	44.8
23	165 19.7	45.0
0	180 19.6	+22 45.3
1	195 19.5	45.5
2	210 19.4	45.8
3	225 19.3	46.0
4	240 19.2	46.2
5	255 19.0	46.5
6	270 18.9	+22 46.7
7	285 18.8	47.0
8	300 18.7	47.2
9	315 18.6	47.4
10	330 18.5	47.7
11	345 18.3	47.9
12	0 18.2	+22 48.1
13	15 18.1	48.4
14	30 18.0	48.6
15	45 17.9	48.8
16	60 17.7	49.1
17	75 17.6	49.3
18	90 17.5	+22 49.5
19	105 17.4	49.8
20	120 17.3	50.0
21	135 17.2	50.2
22	150 17.0	50.4
23	165 16.9	50.7
24	180 16.8	+22 50.9
code	−	+ 3

STARS No.	SHA	Dec.	Transit Mer. Gr.
	° ′	° ′	h m
1	358 32.0	+28 49.2	7 06
2	358 21.8	+58 52.7	7 07
3	349 42.8	−18 15.1	7 42
4	339 21.2	+59 58.8	8 23
5	336 01.5	−57 28.7	8 36
6	332 53.3	+89 02.0	8 49
7	328 53.8	+23 14.0	9 05
8	315 54.0	−40 29.7	9 56
9	309 47.8	+49 41.4	10 21
10	291 43.3	+16 24.9	11 33
11	281 57.3	− 8 15.3	12 12
12	281 44.0	+45 57.2	12 13
13	279 22.4	+ 6 18.5	12 22
14	279 12.0	+28 34.2	12 23
15	276 34.1	− 1 13.8	12 33
16	271 52.2	+ 7 24.1	12 52
17	264 17.4	−52 40.1	13 22
18	259 15.2	−16 38.8	13 42
19	255 49.6	−28 54.3	13 56
20	245 48.8	+ 5 21.1	14 36
21	244 25.0	+28 08.9	14 42
22	234 37.8	−59 21.3	15 21
23	223 27.2	−43 14.3	16 05
24	221 50.6	−69 31.2	16 12
25	218 42.1	− 8 26.8	16 24
26	208 33.2	+12 12.4	17 05
27	194 48.5	+62 01.1	17 59
28	183 21.1	+14 50.7	18 45
29	174 01.7	−62 50.2	19 22
30	172 53.1	−56 50.8	19 27
31	168 46.9	−59 25.7	19 43
32	167 01.0	+56 13.6	19 50
33	159 29.9	+55 10.9	20 20
34	159 20.3	−10 54.7	20 21
35	153 35.1	+49 33.4	20 44
36	149 02.5	−36 08.2	21 02
37	146 38.0	+19 26.0	21 12
38	140 55.4	−60 38.6	21 34
39	137 16.3	+74 21.3	21 49
40	126 50.1	+26 52.5	22 31
41	120 37.8	−22 29.3	22 55
42	113 23.2	−26 19.8	23 24
43	109 06.5	−68 56.7	23 41
44	103 05.7	−15 40.2	0 09
45	97 24.9	−37 04.4	0 32
46	96 49.4	+12 35.5	0 34
47	91 07.3	+51 29.4	0 57
48	84 45.3	−34 24.7	1 22
49	81 10.2	+38 44.0	1 37
50	76 55.8	−26 21.6	1 54
51	62 53.5	+ 8 44.2	2 50
52	54 32.1	−56 53.5	3 23
53	50 03.1	+45 06.1	3 41
54	34 32.8	+ 9 38.9	4 43
55	28 41.9	−47 11.7	5 06
56	16 15.3	−29 52.7	5 56
57	14 24.9	+14 56.5	6 03

Lat.	Sunrise	Twlt. begins	Moonrise 6	7	8	9
N °	h m	h m	h m	h m	h m	h m
70	□	□	□	□	□	□
68	□	□	□	□	□	4 24
66	0 48	////	□	□	□	5 30
64	1 46	////	□	□	3 57	6 04
62	2 19	////	□	2 54	4 46	6 29
60	2 42	////	2 33	3 47	5 16	6 49
58	3 01	////	3 11	4 18	5 39	7 05
56	3 17	////	3 38	4 42	5 58	7 19
54	3 31	////	3 59	5 01	6 14	7 31
52	3 42	////	4 16	5 17	6 27	7 41
50	3 53	////	4 31	5 31	6 39	7 50
45	4 14	1 47	5 01	5 59	7 03	8 10
40	4 31	2 31	5 25	6 21	7 22	8 25
35	4 46	3 01	5 44	6 40	7 39	8 39
30	4 58	3 24	6 01	6 56	7 52	8 50
20	5 20	3 57	6 29	7 22	8 16	9 10
10	5 38	4 21	6 53	7 45	8 37	9 27
0	5 55	4 40	7 15	8 06	8 56	9 42
10	6 12	4 57	7 38	8 28	9 14	9 58
20	6 30	5 12	8 02	8 50	9 35	10 15
30	6 50	5 25	8 30	9 17	9 58	10 34
35	7 02	5 32	8 47	9 32	10 12	10 45
40	7 16	5 38	9 06	9 50	10 27	10 58
45	7 32	5 45	9 29	10 12	10 46	11 13
50	7 52	5 53	10 00	10 39	11 09	11 31
52	8 01	5 56	10 15	10 53	11 20	11 40
54	8 12	5 59	10 32	11 08	11 33	11 49
56	8 24	6 03	10 53	11 26	11 47	12 00
58	8 38	6 07	11 19	11 48	12 04	12 13
60	8 54	6 10	11 56	12 16	12 24	12 27
S						

Lat.	Sunset	Twlt. ends	Moonset 6	7	8	9
N °	h m	h m	h m	h m	h m	h m
70	□	□	□	□	□	□
68	□	□	□	□	□	2 52
66	23 14	////	□	□	□	1 45
64	22 13	////	□	□	1 38	1 10
62	21 40	////	□	0 58	0 49	0 44
60	21 16	////	24 05	0 05	0 18	0 24
58	20 57	////	23 33	23 55	24 07	0 07
56	20 41	////	23 09	23 36	23 53	24 04
54	20 27	////	22 50	23 20	23 40	23 54
52	20 16	////	22 33	23 06	23 29	23 46
50	20 05	////	22 19	22 54	23 19	23 39
45	19 44	22 12	21 50	22 28	22 59	23 24
40	19 26	21 27	21 28	22 08	22 42	23 11
35	19 12	20 58	21 09	21 52	22 28	23 00
30	18 59	20 35	20 53	21 37	22 16	22 50
20	18 38	20 01	20 26	21 12	21 54	22 33
10	18 19	19 36	20 02	20 51	21 36	22 18
0	18 02	19 17	19 40	20 30	21 18	22 04
10	17 46	19 01	19 18	20 10	21 01	21 50
20	17 28	18 46	18 54	19 48	20 42	21 35
30	17 07	18 32	18 27	19 23	20 20	21 18
35	16 55	18 25	18 10	19 08	20 07	21 08
40	16 42	18 19	17 51	18 50	19 53	20 56
45	16 25	18 11	17 28	18 29	19 35	20 42
50	16 05	18 03	16 58	18 02	19 13	20 25
52	15 56	18 01	16 43	17 49	19 02	20 17
54	15 45	17 57	16 26	17 34	18 50	20 08
56	15 33	17 53	16 05	17 17	18 36	19 58
58	15 20	17 50	15 39	16 55	18 20	19 47
60	15 03	17 46	15 03	16 27	18 00	19 33
S						

GCT	Equation of Time (App.—Mean) 6	7	8
h	m s	m s	m s
0	+ 1 40.5	+ 1 29.8	+ 1 18.7
6	+ 1 37.9	+ 1 27.1	+ 1 15.9
12	+ 1 35.2	+ 1 24.3	+ 1 13.1
18	+ 1 32.5	+ 1 21.5	+ 1 10.3
24	+ 1 29.8	+ 1 18.7	+ 1 07.4

GCT of Transit Meridian of Greenwich

DAY	Moon	Venus	Mars	Jupiter	Saturn
	h m	h m	h m	h m	h m
6	13 28	15 11	11 42	7 39	18 50
7	14 18	15 12	11 41	7 36	18 46
8	15 07	15 12	11 40	7 33	18 42
9	15 53	15 13	11 39	7 29	18 39

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb	Venus	Mars
°	′	′	′
0			
	0.1	0.2	0.1
30			
	0.1	0.1	0.0
45			
	0.1	0.1	0.0
60			
	0.1	0.1	0.0
75			
	0.1	0.0	0.0
90			

Moon's Lower Limb
Add

Alt.	6	7	8
°	′	′	′
0			
	11.6	11.7	12.1
4			
	11.6	11.7	12.1
8			
	11.7	11.8	12.2
12			
	11.7	11.8	12.2
16			
	11.8	11.9	12.2
20			
	11.8	12.0	12.3
24			
	11.9	12.0	12.4
28			
	12.0	12.1	12.5
32			
	12.1	12.2	12.6
36			
	12.3	12.4	12.7
40			
	12.4	12.5	12.8
44			
	12.6	12.6	12.9
48			
	12.7	12.8	13.1
52			
	12.9	13.0	13.2
56			
	13.1	13.1	13.4
60			
	13.3	13.3	13.5
64			
	13.4	13.5	13.7
68			
	13.6	13.7	13.9
72			
	13.9	13.9	14.1
76			
	14.1	14.1	14.3
80			
	14.3	14.3	14.4
84			
	14.5	14.5	14.6
88			
	14.7	14.7	14.8
90			

Add to table, back cover

Moon's Upper Limb
Subtract

Alt.	6	7	8
°	′	′	′
0			
	17.8	17.7	17.5
4			
	17.8	17.7	17.5
8			
	17.8	17.7	17.5
12			
	17.7	17.6	17.4
16			
	17.7	17.6	17.4
20			
	17.6	17.5	17.3
24			
	17.5	17.4	17.2
28			
	17.4	17.3	17.2
32			
	17.3	17.2	17.1
36			
	17.2	17.1	16.9
40			
	17.0	17.0	16.8
44			
	16.9	16.8	16.7
48			
	16.7	16.7	16.6
52			
	16.5	16.5	16.4
56			
	16.4	16.3	16.2
60			
	16.2	16.1	16.1
64			
	16.0	16.0	15.9
68			
	15.8	15.8	15.7
72			
	15.6	15.6	15.6
76			
	15.4	15.4	15.4
80			
	15.1	15.2	15.2
84			
	14.9	14.9	15.0
88			
	14.8	14.8	14.9
90			

Subtract from table, back cover

GCT	♈	VENUS −3.8		MARS 1.7		JUPITER −1.9		SATURN 1.2		MOON			
	GHA	GHA	Dec.	GHA	Dec.	GHA	Dec.	GHA	Dec.	GHA	code	Dec.	code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
0	256 33.3	131 51.1	+22 02.1	185 09.7	+22 44.6	247 24.7	+ 2 37.7	79 36.9	+ 3 54.2	129 01.3	128	+22 16.0	− 92
1	271 35.8	146 50.8	01.4	200 10.3	44.8	262 26.8	37.8	94 39.3	54.2	143 33.1	128	22 06.8	− 94
2	286 38.3	161 50.5	00.8	215 10.9	45.0	277 28.9	37.9	109 41.7	54.2	158 04.9	128	21 57.4	− 94
3	301 40.7	176 50.2	·22 00.1	230 11.5	·· 45.3	292 31.0	·· 38.1	124 44.2	·· 54.1	172 36.7	129	·21 48.0	− 96
4	316 43.2	191 50.0	21 59.5	245 12.1	45.5	307 33.1	38.2	139 46.6	54.1	187 08.6	130	21 38.4	− 96
5	331 45.7	206 49.7	58.8	260 12.7	45.8	322 35.2	38.4	154 49.0	54.1	201 40.6	130	21 28.8	− 98
6	346 48.1	221 49.4	+21 58.1	275 13.3	+22 46.0	337 37.3	+ 2 38.5	169 51.4	+ 3 54.1	216 12.6	131	+21 19.0	− 98
7	1 50.6	236 49.1	57.5	290 13.9	46.3	352 39.4	38.7	184 53.9	54.0	230 44.7	131	21 09.2	−100
8	16 53.1	251 48.9	56.8	305 14.5	46.5	7 41.5	38.8	199 56.3	54.0	245 16.8	132	20 59.2	−100
9	31 55.5	266 48.6	·· 56.1	320 15.1	·· 46.7	22 43.6	·· 39.0	214 58.7	·· 54.0	259 49.0	132	·20 49.2	−101
10	46 58.0	281 48.3	55.5	335 15.7	47.0	37 45.7	39.1	230 01.1	53.9	274 21.2	133	20 39.1	−103
11	62 00.5	296 48.0	54.8	350 16.3	47.2	52 47.8	39.2	245 03.5	53.9	288 53.5	133	20 28.8	−103
12	77 02.9	311 47.8	+21 54.1	5 16.9	+22 47.5	67 50.0	+ 2 39.4	260 06.0	+ 3 53.9	303 25.8	134	+20 18.5	−104
13	92 05.4	326 47.5	53.5	20 17.5	47.7	82 52.1	39.5	275 08.4	53.9	317 58.2	134	20 08.1	−105
14	107 07.8	341 47.2	52.8	35 18.1	47.9	97 54.2	39.7	290 10.8	53.8	332 30.6	135	19 57.6	−105
15	122 10.3	356 47.0	·· 52.1	50 18.7	·· 48.2	112 56.3	·· 39.8	305 13.2	·· 53.8	347 03.1	135	·19 47.1	−107
16	137 12.8	11 46.7	51.5	65 19.3	48.4	127 58.4	40.0	320 15.7	53.8	1 35.6	136	19 36.4	−108
17	152 15.2	26 46.4	50.8	80 19.9	48.7	143 00.5	40.1	335 18.1	53.8	16 08.2	136	19 25.6	−108
18	167 17.7	41 46.2	+21 50.1	95 20.5	+22 48.9	158 02.6	+ 2 40.2	350 20.5	+ 3 53.7	30 40.8	137	+19 14.8	−110
19	182 20.2	56 45.9	49.4	110 21.1	49.1	173 04.7	40.4	5 22.9	53.7	45 13.5	138	19 03.8	−110
20	197 22.6	71 45.7	48.8	125 21.7	49.4	188 06.8	40.5	20 25.4	53.7	59 46.3	137	18 52.8	−111
21	212 25.1	86 45.4	·· 48.1	140 22.3	·· 49.6	203 08.9	·· 40.7	35 27.8	·· 53.6	74 19.0	139	·18 41.7	−112
22	227 27.6	101 45.1	47.4	155 22.9	49.8	218 11.0	40.8	50 30.2	53.6	88 51.9	138	18 30.5	−113
23	242 30.0	116 44.9	46.7	170 23.5	50.1	233 13.1	41.0	65 32.6	53.6	103 24.7	140	18 19.2	−113
0	257 32.5	131 44.6	+21 46.1	185 24.1	+22 50.3	248 15.2	+ 2 41.1	80 35.0	+ 3 53.6	117 57.7	139	+18 07.9	−115
1	272 35.0	146 44.4	45.4	200 24.7	50.6	263 17.3	41.2	95 37.5	53.5	132 30.6	140	17 56.4	−115
2	287 37.4	161 44.1	44.7	215 25.3	50.8	278 19.4	41.4	110 39.9	53.5	147 03.6	141	17 44.9	−116
3	302 39.9	176 43.8	·· 44.0	230 25.9	·· 51.0	293 21.5	·· 41.5	125 42.3	·· 53.5	161 36.7	141	·17 33.3	−117
4	317 42.3	191 43.6	43.3	245 26.5	51.3	308 23.6	41.7	140 44.7	53.4	176 09.8	141	17 21.6	−118
5	332 44.8	206 43.3	42.7	260 27.1	51.5	323 25.8	41.8	155 47.1	53.4	190 42.9	142	17 09.8	−118
6	347 47.3	221 43.1	+21 42.0	275 27.7	+22 51.7	338 27.9	+ 2 42.0	170 49.6	+ 3 53.4	205 16.1	142	+16 58.0	−119
7	2 49.7	236 42.8	41.3	290 28.3	52.0	353 30.0	42.1	185 52.0	53.4	219 49.3	143	16 46.1	−120
8	17 52.2	251 42.6	40.6	305 28.9	52.2	8 32.1	42.2	200 54.4	53.3	234 22.6	143	16 34.1	−121
9	32 54.7	266 42.3	·· 39.9	320 29.5	·· 52.4	23 34.2	·· 42.4	215 56.8	·· 53.3	248 55.9	143	·16 22.0	−122
10	47 57.1	281 42.1	39.2	335 30.1	52.7	38 36.3	42.5	230 59.2	53.3	263 29.2	144	16 09.8	−122
11	62 59.6	296 41.8	38.6	350 30.7	52.9	53 38.4	42.7	246 01.7	53.2	278 02.6	144	15 57.6	−123
12	78 02.1	311 41.6	+21 37.9	5 31.3	+22 53.1	68 40.5	+ 2 42.8	261 04.1	+ 3 53.2	292 36.0	145	+15 45.3	−124
13	93 04.5	326 41.3	37.2	20 31.9	53.4	83 42.6	42.9	276 06.5	53.2	307 09.5	145	15 32.9	−124
14	108 07.0	341 41.1	36.5	35 32.5	53.6	98 44.7	43.1	291 08.9	53.2	321 43.0	145	15 20.5	−125
15	123 09.5	356 40.9	·· 35.8	50 33.1	·· 53.8	113 46.8	·· 43.2	306 11.3	·· 53.1	336 16.5	146	·15 08.0	−126
16	138 11.9	11 40.6	35.1	65 33.7	54.0	128 49.0	43.4	321 13.8	53.1	350 50.1	146	14 55.4	−127
17	153 14.4	26 40.4	34.4	80 34.3	54.3	143 51.1	43.5	336 16.2	53.1	5 23.7	146	14 42.7	−127
18	168 16.8	41 40.1	+21 33.7	95 34.9	+22 54.5	158 53.2	+ 2 43.7	351 18.6	+ 3 53.0	19 57.3	147	+14 30.0	−128
19	183 19.3	56 39.9	33.0	110 35.5	54.7	173 55.3	43.8	6 21.0	53.0	34 31.0	147	14 17.2	−129
20	198 21.8	71 39.7	32.3	125 36.1	55.0	188 57.4	43.9	21 23.4	53.0	49 04.7	147	14 04.3	−129
21	213 24.2	86 39.4	·· 31.7	140 36.7	·· 55.2	203 59.5	·· 44.1	36 25.8	·· 52.9	63 38.4	148	·13 51.4	−130
22	228 26.7	101 39.2	31.0	155 37.3	55.4	219 01.6	44.2	51 28.3	52.9	78 12.2	147	13 38.4	−131
23	243 29.2	116 38.9	30.3	170 37.9	55.6	234 03.7	44.4	66 30.7	52.9	92 45.9	149	13 25.3	−131
0	258 31.6	131 38.7	+21 29.6	185 38.5	+22 55.9	249 05.8	+ 2 44.5	81 33.1	+ 3 52.9	107 19.8	148	+13 12.2	−132
1	273 34.1	146 38.5	28.9	200 39.1	56.1	264 07.9	44.6	96 35.5	52.8	121 53.6	149	12 59.0	−132
2	288 36.6	161 38.2	28.2	215 39.7	56.3	279 10.1	44.8	111 37.9	52.8	136 27.5	149	12 45.8	−134
3	303 39.0	176 38.0	·· 27.5	230 40.3	·· 56.5	294 12.2	·· 44.9	126 40.4	·· 52.8	151 01.4	149	·12 32.4	−133
4	318 41.5	191 37.8	26.8	245 40.9	56.8	309 14.3	45.1	141 42.8	52.7	165 35.3	149	12 19.1	−135
5	333 43.9	206 37.5	26.1	260 41.5	57.0	324 16.4	45.2	156 45.2	52.7	180 09.2	150	12 05.6	−135
6	348 46.4	221 37.3	+21 25.4	275 42.1	+22 57.2	339 18.5	+ 2 45.3	171 47.6	+ 3 52.7	194 43.2	150	+11 52.1	−136
7	3 48.9	236 37.1	24.7	290 42.7	57.4	354 20.6	45.5	186 50.0	52.6	209 17.2	150	11 38.5	−136
8	18 51.3	251 36.9	24.0	305 43.3	57.7	9 22.7	45.6	201 52.4	52.6	223 51.2	150	11 24.9	−137
9	33 53.8	266 36.6	·· 23.3	320 43.9	·· 57.9	24 24.8	·· 45.8	216 54.8	·· 52.6	238 25.2	150	·11 11.2	−137
10	48 56.3	281 36.4	22.6	335 44.5	58.1	39 27.0	45.9	231 57.3	52.6	252 59.2	151	10 57.5	−138
11	63 58.7	296 36.2	21.9	350 45.1	58.3	54 29.1	46.0	246 59.7	52.5	267 33.3	151	10 43.7	−139
12	79 01.2	311 36.0	+21 21.2	5 45.7	+22 58.6	69 31.2	+ 2 46.2	262 02.1	+ 3 52.5	282 07.4	151	+10 29.8	−139
13	94 03.7	326 35.7	20.4	20 46.3	58.8	84 33.3	46.3	277 04.5	52.5	296 41.5	151	10 15.9	−140
14	109 06.1	341 35.5	19.7	35 46.9	59.0	99 35.4	46.5	292 06.9	52.4	311 15.6	151	10 01.9	−140
15	124 08.6	356 35.3	·· 19.0	50 47.5	·· 59.2	114 37.5	·· 46.6	307 09.3	·· 52.4	325 49.7	151	· 9 47.9	−140
16	139 11.1	11 35.1	18.3	65 48.0	59.5	129 39.6	46.7	322 11.8	52.4	340 23.8	151	9 33.9	−142
17	154 13.5	26 34.9	17.6	80 48.6	59.7	144 41.8	46.9	337 14.2	52.3	354 57.9	152	9 19.7	−141
18	169 16.0	41 34.6	+21 16.9	95 49.2	+22 59.9	159 43.9	+ 2 47.0	352 16.6	+ 3 52.3	9 32.1	151	+ 9 05.6	−143
19	184 18.4	56 34.4	16.2	110 49.8	23 00.1	174 46.0	47.1	7 19.0	52.3	24 06.2	152	8 51.3	−143
20	199 20.9	71 34.2	15.5	125 50.4	00.3	189 48.1	47.3	22 21.4	52.2	38 40.4	152	8 37.0	−143
21	214 23.4	86 34.0	·· 14.8	140 51.0	·· 00.6	204 50.2	·· 47.4	37 23.8	·· 52.2	53 14.6	152	· 8 22.7	−144
22	229 25.8	101 33.8	14.1	155 51.6	00.8	219 52.3	47.6	52 26.2	52.2	67 48.8	151	8 08.3	−144
23	244 28.3	116 33.6	13.3	170 52.2	01.0	234 54.5	47.7	67 28.7	52.2	82 22.9	152	7 53.9	−145
24	259 30.8	131 33.4	+21 12.6	185 52.8	+23 01.2	249 56.6	+ 2 47.8	82 31.1	+ 3 52.1	96 57.1	152	+ 7 39.4	−145
code	—	− 3	− 7	+ 6	+ 3	+ 21	+ 1	+ 24	0				

SUN

GCT h	GHA ° ′	Dec. ° ′
0	180 16.8	+22 50.9
1	195 16.7	51.1
2	210 16.6	51.3
3	225 16.4	51.6
4	240 16.3	51.8
5	255 16.2	52.0
6	270 16.1	+22 52.2
7	285 16.0	52.5
8	300 15.8	52.7
9	315 15.7	52.9
10	330 15.6	53.1
11	345 15.5	53.3
12	0 15.4	+22 53.5
13	15 15.2	53.8
14	30 15.1	54.0
15	45 15.0	54.2
16	60 14.9	54.4
17	75 14.7	54.6
18	90 14.6	+22 54.8
19	105 14.5	55.1
20	120 14.4	55.3
21	135 14.3	55.5
22	150 14.1	55.7
23	165 14.0	55.9
0	180 13.9	+22 56.1
1	195 13.8	56.3
2	210 13.7	56.5
3	225 13.5	56.7
4	240 13.4	56.9
5	255 13.3	57.1
6	270 13.2	+22 57.3
7	285 13.0	57.5
8	300 12.9	57.8
9	315 12.8	58.0
10	330 12.7	58.2
11	345 12.6	58.4
12	0 12.4	+22 58.6
13	15 12.3	58.8
14	30 12.2	59.0
15	45 12.1	59.2
16	60 11.9	59.4
17	75 11.8	59.6
18	90 11.7	+22 59.8
19	105 11.6	22 59.9
20	120 11.4	23 00.1
21	135 11.3	00.3
22	150 11.2	00.5
23	165 11.1	00.7
0	180 10.9	+23 00.9
1	195 10.8	01.1
2	210 10.7	01.3
3	225 10.6	01.5
4	240 10.4	01.7
5	255 10.3	01.9
6	270 10.2	+23 02.1
7	285 10.1	02.2
8	300 09.9	02.4
9	315 09.8	02.6
10	330 09.7	02.8
11	345 09.6	03.0
12	0 09.4	+23 03.2
13	15 09.3	03.4
14	30 09.2	03.5
15	45 09.1	03.7
16	60 08.9	03.9
17	75 08.8	04.1
18	90 08.7	+23 04.3
19	105 08.6	04.4
20	120 08.4	04.6
21	135 08.3	04.8
22	150 08.2	05.0
23	165 08.1	05.1
24	180 07.9	+23 05.3
code	—	+ 2

STARS

No.	SHA ° ′	Dec. ° ′	Transit Mer. Gr. h m
1	358 32.0	+28 49.2	6 55
2	358 21.7	+58 52.7	6 55
3	349 42.7	−18 15.0	7 30
4	339 21.2	+59 58.8	8 11
5	336 01.5	−57 28.7	8 24
6	332 52.4	+89 02.0	8 37
7	328 53.8	+23 14.0	8 53
8	315 53.9	−40 29.7	9 45
9	309 47.8	+49 41.4	10 09
10	291 43.3	+16 24.9	11 21
11	281 57.2	− 8 15.3	12 00
12	281 44.0	+45 57.2	12 01
13	279 22.4	+ 6 18.6	12 10
14	279 12.0	+28 34.2	12 11
15	276 34.1	− 1 13.8	12 22
16	271 52.1	+ 7 24.1	12 40
17	264 17.4	−52 40.1	13 11
18	259 15.2	−16 38.8	13 31
19	255 49.6	−28 54.3	13 44
20	245 48.8	+ 5 21.1	14 24
21	244 25.0	+28 08.9	14 30
22	234 37.8	−59 21.3	15 09
23	223 27.2	−43 14.3	15 53
24	221 50.6	−69 31.2	16 00
25	218 42.1	− 8 26.8	16 12
26	208 33.2	+12 12.4	16 53
27	194 48.5	+62 01.1	17 48
28	183 21.1	+14 50.7	18 33
29	174 01.7	−62 50.2	19 11
30	172 53.1	−56 50.8	19 15
31	168 46.9	−59 25.7	19 32
32	167 01.0	+56 13.6	19 39
33	159 29.9	+55 10.9	20 09
34	159 20.3	−10 54.7	20 09
35	153 35.1	+49 33.4	20 32
36	149 02.5	−36 08.2	20 50
37	146 38.0	+19 26.0	21 00
38	140 55.4	−60 38.6	21 23
39	137 16.3	+74 21.3	21 37
40	126 50.1	+26 52.5	22 19
41	120 37.8	−22 29.3	22 44
42	113 23.2	−26 19.8	23 12
43	109 06.5	−68 56.7	23 30
44	103 05.7	−15 40.2	23 54
45	97 24.9	−37 04.4	0 20
46	96 49.4	+12 35.5	0 22
47	91 07.3	+51 29.4	0 45
48	84 45.3	−34 24.7	1 11
49	81 10.2	+38 44.0	1 25
50	76 55.7	−26 21.6	1 42
51	62 53.5	+ 8 44.2	2 38
52	54 32.1	−56 53.5	3 11
53	50 03.1	+45 06.1	3 29
54	34 32.8	+ 9 39.0	4 31
55	28 41.9	−47 11.6	4 54
56	16 15.2	−29 52.7	5 44
57	14 24.8	+14 56.5	5 51

Sunrise, Twilight, Moonrise

Lat. °	Sunrise h m	Twlt. begins h m	Moonrise 9 h m	10 h m	11 h m	12 h m
N 70	□	□	□	6 37	8 56	10 57
68	□	□	4 24	7 10	9 11	11 03
66	0 32	////	5 30	7 34	9 24	11 08
64	1 40	////	6 04	7 53	9 34	11 12
62	2 15	////	6 29	8 08	9 43	11 16
60	2 39	////	6 49	8 21	9 50	11 19
58	2 59	////	7 05	8 31	9 57	11 21
56	3 15	////	7 19	8 41	10 02	11 24
54	3 29	////	7 31	8 49	10 07	11 26
52	3 41	////	7 41	8 57	10 12	11 28
50	3 51	////	7 50	9 03	10 16	11 30
45	4 13	1 43	8 10	9 17	10 25	11 33
40	4 31	2 29	8 25	9 29	10 33	11 37
35	4 45	3 00	8 39	9 39	10 39	11 39
30	4 58	3 22	8 50	9 48	10 45	11 42
20	5 20	3 56	9 10	10 02	10 54	11 46
10	5 38	4 21	9 27	10 15	11 03	11 50
0	5 56	4 40	9 42	10 27	11 11	11 53
10	6 13	4 57	9 58	10 39	11 18	11 57
20	6 31	5 12	10 15	10 52	11 27	12 00
30	6 52	5 26	10 34	11 07	11 36	12 04
35	7 04	5 33	10 45	11 15	11 42	12 07
40	7 18	5 40	10 58	11 24	11 48	12 09
45	7 34	5 47	11 13	11 35	11 55	12 13
50	7 54	5 54	11 31	11 49	12 03	12 16
52	8 04	5 58	11 40	11 55	12 07	12 18
54	8 15	6 02	11 49	12 02	12 11	12 20
56	8 27	6 05	12 00	12 10	12 16	12 22
58	8 41	6 09	12 13	12 18	12 21	12 24
60	8 58	6 13	12 27	12 28	12 27	12 27
S						

Sunset, Twilight, Moonset

Lat. °	Sunset h m	Twlt. ends h m	Moonset 9 h m	10 h m	11 h m	12 h m
N 70	□	□	□	2 15	1 27	0 56
68	□	□	2 52	1 40	1 10	0 48
66	23 33	////	1 45	1 15	0 56	0 41
64	22 20	////	1 10	0 55	0 44	0 35
62	21 45	////	0 44	0 39	0 34	0 30
60	21 20	////	0 24	0 25	0 26	0 25
58	21 00	////	0 07	0 14	0 18	0 21
56	20 44	////	24 04	0 04	0 11	0 17
54	20 30	////	23 54	24 05	0 05	0 14
52	20 18	////	23 46	24 00	0 00	0 11
50	20 08	////	23 39	23 55	24 08	0 08
45	19 46	22 16	23 24	23 44	24 02	0 02
40	19 28	21 30	23 11	23 35	23 58	24 19
35	19 13	20 59	23 00	23 27	23 53	24 18
30	19 00	20 36	22 50	23 21	23 49	24 17
20	18 39	20 03	22 33	23 09	23 43	24 16
10	18 20	19 37	22 18	22 58	23 37	24 15
0	18 03	19 18	22 04	22 48	23 31	24 14
10	17 46	19 01	21 50	22 38	23 25	24 12
20	17 28	18 46	21 35	22 27	23 19	24 11
30	17 07	18 32	21 18	22 15	23 12	24 10
35	16 55	18 25	21 08	22 08	23 08	24 09
40	16 41	18 18	20 56	22 00	23 03	24 08
45	16 25	18 11	20 42	21 50	22 58	24 07
50	16 04	18 03	20 25	21 38	22 51	24 05
52	15 55	18 00	20 17	21 33	22 48	24 05
54	15 44	17 56	20 08	21 27	22 45	24 04
56	15 32	17 53	19 58	21 20	22 41	24 03
58	15 17	17 48	19 47	21 12	22 37	24 02
60	15 01	17 45	19 33	21 03	22 32	24 01
S						

Equation of Time (App.—Mean)

GCT h	9 m s	10 m s	11 m s
0	+ 1 07.4	+ 0 55.8	+ 0 44.0
6	+ 1 04.5	+ 0 52.9	+ 0 41.0
12	+ 1 01.7	+ 0 50.0	+ 0 38.0
18	+ 0 58.8	+ 0 47.0	+ 0 35.0
24	+ 0 55.8	+ 0 44.0	+ 0 32.0

GCT of Transit Meridian of Greenwich

DAY	Moon h m	Venus h m	Mars h m	Jupiter h m	Saturn h m
9	15 53	15 13	11 39	7 29	18 39
10	16 38	15 13	11 38	7 26	18 35
11	17 21	15 14	11 37	7 23	18 31
12	18 03	15 14	11 36	7 19	18 27

ADDITIONAL ALTITUDE CORRECTIONS

Alt. °	Sun's Low'r Limb ′	Venus ′	Mars ′
0			
	0.1	0.2	0.1
30			
	0.1	0.1	0.0
45			
	0.1	0.1	0.0
60			
	0.1	0.1	0.0
75			
	0.1	0.0	0.0
90			

Moon's Lower Limb

Add

Alt. °	9 ′	10 ′	11 ′
0			
	12.5	13.1	13.9
4			
	12.5	13.1	13.9
8			
	12.5	13.2	13.9
12			
	12.6	13.2	13.9
16			
	12.6	13.2	14.0
20			
	12.7	13.3	14.0
24			
	12.7	13.3	14.0
28			
	12.8	13.4	14.1
32			
	12.9	13.5	14.1
36			
	13.0	13.5	14.2
40			
	13.1	13.6	14.2
44			
	13.2	13.7	14.3
48			
	13.4	13.8	14.4
52			
	13.5	13.9	14.4
56			
	13.6	14.0	14.5
60			
	13.8	14.1	14.6
64			
	13.9	14.3	14.7
68			
	14.1	14.4	14.8
72			
	14.2	14.5	14.8
76			
	14.4	14.6	14.9
80			
	14.6	14.8	15.0
84			
	14.7	14.9	15.1
88			
	14.9	15.0	15.2
90			

Add to table, back cover

Moon's Upper Limb

Subtract

Alt. °	9 ′	10 ′	11 ′
0			
	17.3	16.9	16.5
4			
	17.3	16.9	16.5
8			
	17.3	16.9	16.5
12			
	17.2	16.9	16.5
16			
	17.2	16.8	16.4
20			
	17.1	16.8	16.4
24			
	17.1	16.7	16.4
28			
	17.0	16.7	16.3
32			
	16.9	16.6	16.3
36			
	16.8	16.5	16.2
40			
	16.7	16.4	16.2
44			
	16.6	16.4	16.1
48			
	16.4	16.3	16.0
52			
	16.3	16.2	16.0
56			
	16.2	16.0	15.9
60			
	16.0	15.9	15.8
64			
	15.9	15.8	15.7
68			
	15.7	15.7	15.6
72			
	15.6	15.6	15.6
76			
	15.4	15.4	15.5
80			
	15.2	15.3	15.4
84			
	15.1	15.2	15.3
88			
	14.9	15.1	15.2
90			

Subtract from table, back cover

Hebrew Pentecost (Shebuoth) 10

G C T	♈ GHA	VENUS −3.8 GHA	VENUS Dec.	MARS 1.7 GHA	MARS Dec.	JUPITER −1.9 GHA	JUPITER Dec.	SATURN 1.2 GHA	SATURN Dec.	MOON GHA	code	MOON Dec.	code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
0	259 30.8	131 33.4	+21 12.6	185 52.8	+23 01.2	249 56.6	+ 2 47.8	82 31.1	+ 3 52.1	96 57.1	152	+ 7 39.4	−145
1	274 33.2	146 33.2	11.9	200 53.4	01.4	264 58.7	48.0	97 33.5	52.1	111 31.3	152	7 24.9	−145
2	289 35.7	161 32.9	11.2	215 54.0	01.6	280 00.8	48.1	112 35.9	52.1	126 05.5	152	7 10.4	−146
3	304 38.2	176 32.7	·· 10.5	230 54.6	·· 01.9	295 02.9	·· 48.3	127 38.3	·· 52.0	140 39.7	152	· 6 55.8	−147
4	319 40.6	191 32.5	09.8	245 55.2	02.1	310 05.0	48.4	142 40.7	52.0	155 13.9	151	6 41.1	−147
5	334 43.1	206 32.3	09.1	260 55.8	02.3	325 07.2	48.5	157 43.1	52.0	169 48.0	152	6 26.4	−147
6	349 45.6	221 32.1	+21 08.3	275 56.4	+23 02.5	340 09.3	+ 2 48.7	172 45.5	+ 3 51.9	184 22.2	152	+ 6 11.7	−148
7	4 48.0	236 31.9	07.6	290 57.0	02.7	355 11.4	48.8	187 48.0	51.9	198 56.4	152	5 56.9	−148
8	19 50.5	251 31.7	06.9	305 57.6	02.9	10 13.5	48.9	202 50.4	51.9	213 30.6	151	5 42.1	−149
9	34 52.9	266 31.5	·· 06.2	320 58.2	·· 03.2	25 15.6	·· 49.1	217 52.8	·· 51.8	228 04.7	152	· 5 27.2	−149
10	49 55.4	281 31.3	05.5	335 58.8	03.4	40 17.7	49.2	232 55.2	51.8	242 38.9	151	5 12.3	−149
11	64 57.9	296 31.1	04.7	350 59.4	03.6	55 19.9	49.4	247 57.6	51.8	257 13.0	151	4 57.4	−150
12	80 00.3	311 30.9	+21 04.0	6 00.0	+23 03.8	70 22.0	+ 2 49.5	263 00.0	+ 3 51.7	271 47.1	151	+ 4 42.4	−150
13	95 02.8	326 30.7	03.3	21 00.6	04.0	85 24.1	49.6	278 02.4	51.7	286 21.2	151	4 27.4	−151
14	110 05.3	341 30.5	02.6	36 01.2	04.2	100 26.2	49.8	293 04.8	51.7	300 55.3	151	4 12.3	−150
15	125 07.7	356 30.3	·· 01.8	51 01.8	·· 04.4	115 28.3	·· 49.9	308 07.3	·· 51.6	315 29.4	151	· 3 57.3	−151
16	140 10.2	11 30.1	01.1	66 02.4	04.6	130 30.5	50.0	323 09.7	51.6	330 03.5	150	3 42.2	−152
17	155 12.7	26 29.9	21 00.4	81 03.0	04.9	145 32.6	50.2	338 12.1	51.6	344 37.5	151	3 27.0	−152
18	170 15.1	41 29.7	+20 59.7	96 03.6	+23 05.1	160 34.7	+ 2 50.3	353 14.5	+ 3 51.5	359 11.6	150	+ 3 11.8	−152
19	185 17.6	56 29.5	58.9	111 04.2	05.3	175 36.8	50.4	8 16.9	51.5	13 45.6	150	2 56.6	−152
20	200 20.0	71 29.3	58.2	126 04.8	05.5	190 38.9	50.6	23 19.3	51.5	28 19.6	149	2 41.4	−153
21	215 22.5	86 29.2	·· 57.5	141 05.4	·· 05.7	205 41.0	·· 50.7	38 21.7	·· 51.4	42 53.5	150	· 2 26.1	−153
22	230 25.0	101 29.0	56.7	156 06.0	05.9	220 43.2	50.9	53 24.1	51.4	57 27.5	149	2 10.8	−153
23	245 27.4	116 28.8	56.0	171 06.6	06.1	235 45.3	51.0	68 26.5	51.4	72 01.4	149	1 55.5	−154
0	260 29.9	131 28.6	+20 55.3	186 07.2	+23 06.3	250 47.4	+ 2 51.1	83 28.9	+ 3 51.3	86 35.3	148	+ 1 40.1	−154
1	275 32.4	146 28.4	54.5	201 07.8	06.5	265 49.5	51.3	98 31.4	51.3	101 09.1	149	1 24.7	−154
2	290 34.8	161 28.2	53.8	216 08.4	06.7	280 51.7	51.4	113 33.8	51.3	115 43.0	148	1 09.3	−154
3	305 37.3	176 28.0	·· 53.1	231 09.0	·· 07.0	295 53.8	·· 51.5	128 36.2	·· 51.2	130 16.8	147	· 0 53.9	−155
4	320 39.8	191 27.9	52.3	246 09.6	07.2	310 55.9	51.7	143 38.6	51.2	144 50.5	148	0 38.4	−155
5	335 42.2	206 27.7	51.6	261 10.2	07.4	325 58.0	51.8	158 41.0	51.2	159 24.3	146	0 22.9	−155
6	350 44.7	221 27.5	+20 50.9	276 10.8	+23 07.6	341 00.1	+ 2 51.9	173 43.4	+ 3 51.1	173 57.9	147	+ 0 07.4	−155
7	5 47.2	236 27.3	50.1	291 11.4	07.8	356 02.3	52.1	188 45.8	51.1	188 31.6	146	− 0 08.1	−155
8	20 49.6	251 27.1	49.4	306 12.0	08.0	11 04.4	52.2	203 48.2	51.1	203 05.2	146	0 23.6	−156
9	35 52.1	266 27.0	·· 48.7	321 12.6	·· 08.2	26 06.5	·· 52.3	218 50.6	·· 51.0	217 38.8	145	· 0 39.2	−156
10	50 54.5	281 26.8	47.9	336 13.2	08.4	41 08.6	52.5	233 53.0	51.0	232 12.3	145	0 54.8	−156
11	65 57.0	296 26.6	47.2	351 13.8	08.6	56 10.8	52.6	248 55.4	51.0	246 45.8	145	1 10.4	−156
12	80 59.5	311 26.4	+20 46.4	6 14.4	+23 08.8	71 12.9	+ 2 52.7	263 57.8	+ 3 50.9	261 19.3	144	− 1 26.0	−156
13	96 01.9	326 26.3	45.7	21 15.0	09.0	86 15.0	52.9	279 00.3	50.9	275 52.7	144	1 41.6	−156
14	111 04.4	341 26.1	45.0	36 15.6	09.2	101 17.1	53.0	294 02.7	50.9	290 26.1	143	1 57.2	−157
15	126 06.9	356 25.9	·· 44.2	51 16.2	·· 09.4	116 19.2	·· 53.2	309 05.1	·· 50.8	304 59.4	142	· 2 12.9	−157
16	141 09.3	11 25.7	43.5	66 16.8	09.6	131 21.4	53.3	324 07.5	50.8	319 32.6	143	2 28.6	−156
17	156 11.8	26 25.6	42.7	81 17.4	09.8	146 23.5	53.4	339 09.9	50.8	334 05.9	141	2 44.2	−157
18	171 14.3	41 25.4	+20 42.0	96 18.0	+23 10.0	161 25.6	+ 2 53.6	354 12.3	+ 3 50.7	348 39.0	141	− 2 59.9	−157
19	186 16.7	56 25.2	41.2	111 18.6	10.2	176 27.7	53.7	9 14.7	50.7	3 12.1	141	3 15.6	−157
20	201 19.2	71 25.1	40.5	126 19.2	10.4	191 29.9	53.8	24 17.1	50.7	17 45.2	140	3 31.3	−157
21	216 21.7	86 24.9	·· 39.7	141 19.8	·· 10.6	206 32.0	·· 54.0	39 19.5	·· 50.6	32 18.2	139	· 3 47.0	−157
22	231 24.1	101 24.7	39.0	156 20.4	10.8	221 34.1	54.1	54 21.9	50.6	46 51.1	139	4 02.7	−157
23	246 26.6	116 24.6	38.2	171 21.0	11.0	236 36.2	54.2	69 24.3	50.6	61 24.0	138	4 18.4	−157
0	261 29.0	131 24.4	+20 37.5	186 21.6	+23 11.2	251 38.4	+ 2 54.4	84 26.7	+ 3 50.5	75 56.8	138	− 4 34.1	−158
1	276 31.5	146 24.2	36.7	201 22.2	11.4	266 40.5	54.5	99 29.1	50.5	90 29.6	136	4 49.9	−157
2	291 34.0	161 24.1	36.0	216 22.8	11.6	281 42.6	54.6	114 31.5	50.5	105 02.2	137	5 05.6	−157
3	306 36.4	176 23.9	·· 35.2	231 23.4	·· 11.8	296 44.8	·· 54.8	129 33.9	·· 50.4	119 34.9	135	· 5 21.3	−157
4	321 38.9	191 23.8	34.5	246 24.0	12.0	311 46.9	54.9	144 36.3	50.4	134 07.4	135	5 37.0	−157
5	336 41.4	206 23.6	33.7	261 24.6	12.2	326 49.0	55.0	159 38.8	50.3	148 39.9	134	5 52.7	−157
6	351 43.8	221 23.5	+20 33.0	276 25.2	+23 12.4	341 51.1	+ 2 55.2	174 41.2	+ 3 50.3	163 12.3	134	− 6 08.4	−157
7	6 46.3	236 23.3	32.2	291 25.8	12.6	356 53.3	55.3	189 43.6	50.3	177 44.7	132	6 24.1	−157
8	21 48.8	251 23.1	31.5	306 26.4	12.8	11 55.4	55.4	204 46.0	50.2	192 16.9	132	6 39.8	−157
9	36 51.2	266 23.0	·· 30.7	321 26.9	·· 13.0	26 57.5	·· 55.6	219 48.4	·· 50.2	206 49.1	132	· 6 55.5	−156
10	51 53.7	281 22.8	30.0	336 27.5	13.2	41 59.6	55.7	234 50.8	50.2	221 21.3	130	7 11.1	−157
11	66 56.1	296 22.7	29.2	351 28.1	13.4	57 01.8	55.8	249 53.2	50.1	235 53.3	130	7 26.8	−157
12	81 58.6	311 22.5	+20 28.5	6 28.7	+23 13.6	72 03.9	+ 2 56.0	264 55.6	+ 3 50.1	250 25.3	128	− 7 42.5	−156
13	97 01.1	326 22.4	27.7	21 29.3	13.8	87 06.0	56.1	279 58.0	50.1	264 57.1	128	7 58.1	−156
14	112 03.5	341 22.2	26.9	36 29.9	14.0	102 08.2	56.2	295 00.4	50.0	279 28.9	128	8 13.7	−156
15	127 06.0	356 22.1	·· 26.2	51 30.5	·· 14.2	117 10.3	·· 56.4	310 02.8	·· 50.0	294 00.7	126	· 8 29.3	−156
16	142 08.5	11 22.0	25.4	66 31.1	14.4	132 12.4	56.5	325 05.2	50.0	308 32.3	125	8 44.9	−155
17	157 10.9	26 21.8	24.7	81 31.7	14.6	147 14.5	56.6	340 07.6	49.9	323 03.8	125	9 00.4	−156
18	172 13.4	41 21.7	+20 23.9	96 32.3	+23 14.8	162 16.7	+ 2 56.7	355 10.0	+ 3 49.9	337 35.3	124	− 9 16.0	−155
19	187 15.9	56 21.5	23.1	111 32.9	15.0	177 18.8	56.9	10 12.4	49.8	352 06.7	122	9 31.5	−155
20	202 18.3	71 21.4	22.4	126 33.5	15.2	192 20.9	57.0	25 14.8	49.8	6 37.9	122	9 47.0	−155
21	217 20.8	86 21.2	·· 21.6	141 34.1	·· 15.4	207 23.1	·· 57.1	40 17.2	·· 49.8	21 09.1	121	·10 02.5	−154
22	232 23.3	101 21.1	20.8	156 34.7	15.5	222 25.2	57.3	55 19.6	49.7	35 40.2	120	10 17.9	−154
23	247 25.7	116 21.0	20.1	171 35.3	15.7	237 27.3	57.4	70 22.0	49.7	50 11.2	119	10 33.3	−154
24	262 28.2	131 20.8	+20 19.3	186 35.9	+23 15.9	252 29.5	+ 2 57.5	85 24.4	+ 3 49.7	64 42.1	118	−10 48.7	−154
code	—	− 1	− 7	+ 6	+ 2	+ 21	+ 2	+ 25	0				

GCT	SUN GHA	SUN Dec.
h	° ′	° ′
0	180 07.9	+23 05.3
1	195 07.8	05.5
2	210 07.7	05.7
3	225 07.6	·· 05.8
4	240 07.4	06.0
5	255 07.3	06.2
6	270 07.2	+23 06.4
7	285 07.0	06.5
8	300 06.9	06.7
9	315 06.8	·· 06.9
10	330 06.7	07.0
11	345 06.5	07.2
12	0 06.4	+23 07.4
13	15 06.3	07.5
14	30 06.2	07.7
15	45 06.0	·· 07.9
16	60 05.9	08.0
17	75 05.8	08.2
18	90 05.6	+23 08.4
19	105 05.5	08.5
20	120 05.4	08.7
21	135 05.3	·· 08.8
22	150 05.1	09.0
23	165 05.0	09.2
0	180 04.9	+23 09.3
1	195 04.8	09.5
2	210 04.6	09.6
3	225 04.5	·· 09.8
4	240 04.4	10.0
5	255 04.2	10.1
6	270 04.1	+23 10.3
7	285 04.0	10.4
8	300 03.9	10.6
9	315 03.7	·· 10.7
10	330 03.6	10.9
11	345 03.5	11.0
12	0 03.3	+23 11.2
13	15 03.2	11.3
14	30 03.1	11.5
15	45 03.0	·· 11.6
16	60 02.8	11.8
17	75 02.7	11.9
18	90 02.6	+23 12.1
19	105 02.4	12.2
20	120 02.3	12.3
21	135 02.2	·· 12.5
22	150 02.0	12.6
23	165 01.9	12.8
0	180 01.8	+23 12.9
1	195 01.7	13.1
2	210 01.5	13.2
3	225 01.4	·· 13.3
4	240 01.3	13.5
5	255 01.1	13.6
6	270 01.0	+23 13.7
7	285 00.9	13.9
8	300 00.7	14.0
9	315 00.6	·· 14.2
10	330 00.5	14.3
11	345 00.4	14.4
12	0 00.2	+23 14.6
13	15 00.1	14.7
14	30 00.0	14.8
15	44 59.8	·· 15.0
16	59 59.7	15.1
17	74 59.6	15.2
18	89 59.4	+23 15.3
19	104 59.3	15.5
20	119 59.2	15.6
21	134 59.1	·· 15.7
22	149 58.9	15.8
23	164 58.8	16.0
24	179 58.7	+23 16.1
code	−	+ 1

No.	STARS SHA	STARS Dec.	Transit Mer. Gr.
	° ′	° ′	h m
1	358 32.0	+28 49.2	6 43
2	358 21.7	+58 52.7	6 43
3	349 42.7	−18 15.0	7 18
4	339 21.2	+59 58.8	7 59
5	336 01.5	−57 28.7	8 13
6	332 51.6	+89 02.0	8 25
7	328 53.8	+23 14.0	8 41
8	315 53.9	−40 29.7	9 33
9	309 47.8	+49 41.4	9 57
10	291 43.3	+16 24.9	11 09
11	281 57.2	− 8 15.2	11 48
12	281 44.0	+45 57.2	11 49
13	279 22.4	+ 6 18.6	11 59
14	279 12.0	+28 34.2	11 59
15	276 34.1	− 1 13.8	12 10
16	271 52.1	+ 7 24.1	12 28
17	264 17.4	−52 40.0	12 59
18	259 15.2	−16 38.8	13 19
19	255 49.6	−28 54.2	13 32
20	245 48.8	+ 5 21.2	14 12
21	244 25.0	+28 08.9	14 18
22	234 37.8	−59 21.3	14 57
23	223 27.2	−43 14.3	15 42
24	221 50.7	−69 31.2	15 48
25	218 42.1	− 8 26.8	16 01
26	208 33.2	+12 12.4	16 41
27	194 48.5	+62 01.1	17 36
28	183 21.1	+14 50.7	18 22
29	174 01.7	−62 50.2	18 59
30	172 53.1	−56 50.8	19 03
31	168 46.9	−59 25.8	19 20
32	167 01.1	+56 13.6	19 27
33	159 29.9	+55 10.9	19 57
34	159 20.3	−10 54.7	19 57
35	153 35.1	+49 33.4	20 20
36	149 02.5	−36 08.2	20 38
37	146 38.0	+19 26.0	20 48
38	140 55.4	−60 38.6	21 11
39	137 16.3	+74 21.3	21 25
40	126 50.1	+26 52.6	22 07
41	120 37.8	−22 29.3	22 32
42	113 23.2	−26 19.8	23 01
43	109 06.5	−68 56.7	23 18
44	103 05.7	−15 40.2	23 42
45	97 24.9	−37 04.4	0 08
46	96 49.4	+12 35.5	0 11
47	91 07.3	+51 29.5	0 33
48	84 45.3	−34 24.7	0 59
49	81 10.2	+38 44.0	1 13
50	76 55.7	−26 21.6	1 30
51	62 53.5	+ 8 44.2	2 26
52	54 32.0	−56 53.5	2 59
53	50 03.1	+45 06.1	3 17
54	34 32.8	+ 9 39.0	4 19
55	28 41.9	−47 11.6	4 42
56	16 15.2	−29 52.7	5 32
57	14 24.8	+14 56.5	5 39

Lat.	Sunrise	Twlt. begins	Moonrise 12	Moonrise 13	Moonrise 14	Moonrise 15
N °	h m	h m	h m	h m	h m	h m
70	□	□	10 57	12 56	15 03	17 32
68	□	□	11 03	12 54	14 52	17 05
66	0 06	////	11 08	12 52	14 43	16 45
64	1 36	////	11 12	12 51	14 35	16 29
62	2 12	////	11 16	12 50	14 28	16 15
60	2 37	////	11 19	12 49	14 23	16 04
58	2 57	////	11 21	12 48	14 18	15 54
56	3 14	////	11 24	12 47	14 13	15 46
54	3 28	////	11 26	12 46	14 10	15 39
52	3 40	////	11 28	12 45	14 06	15 32
50	3 50	////	11 30	12 45	14 03	15 26
45	4 13	1 42	11 33	12 43	13 56	15 13
40	4 30	2 29	11 37	12 42	13 50	15 03
35	4 45	2 59	11 39	12 41	13 45	14 54
30	4 58	3 22	11 42	12 40	13 41	14 46
20	5 20	3 56	11 46	12 39	13 34	14 32
10	5 39	4 22	11 50	12 38	13 27	14 21
0	5 56	4 41	11 53	12 36	13 21	14 10
10	6 13	4 58	11 57	12 35	13 16	13 59
20	6 32	5 13	12 00	12 34	13 09	13 48
30	6 53	5 27	12 04	12 33	13 02	13 35
35	7 05	5 34	12 07	12 32	12 58	13 28
40	7 19	5 41	12 09	12 31	12 54	13 20
45	7 36	5 48	12 13	12 30	12 49	13 10
50	7 56	5 56	12 16	12 29	12 43	12 59
52	8 06	6 00	12 18	12 28	12 40	12 53
54	8 17	6 03	12 20	12 28	12 37	12 47
56	8 29	6 07	12 22	12 27	12 33	12 41
58	8 44	6 11	12 24	12 27	12 29	12 34
60	9 01	6 15	12 27	12 26	12 25	12 25
S						

Lat.	Sunset	Twlt. ends	Moonset 12	Moonset 13	Moonset 14	Moonset 15
N °	h m	h m	h m	h m	h m	h m
70	□	□	0 56	0 30	{0 04 {23 33	22 47
68	□	□	0 48	0 29	{0 09 {23 47	23 16
66	□	□	0 41	0 27	{0 13 {23 58	23 38
64	22 25	////	0 35	0 26	0 17	{0 07 {23 56
62	21 49	////	0 30	0 25	0 20	0 16
60	21 23	////	0 25	0 24	0 23	0 23
58	21 03	////	0 21	0 23	0 26	0 29
56	20 46	////	0 17	0 23	0 28	0 34
54	20 32	////	0 14	0 22	0 30	0 39
52	20 20	////	0 11	0 22	0 32	0 44
50	20 10	////	0 08	0 21	0 34	0 48
45	19 47	22 19	0 02	0 20	0 38	0 57
40	19 29	21 32	24 19	0 19	0 41	1 05
35	19 14	21 01	24 18	0 18	0 44	1 11
30	19 02	20 38	24 17	0 17	0 46	1 17
20	18 40	20 04	24 16	0 16	0 50	1 27
10	18 21	19 38	24 15	0 15	0 54	1 36
0	18 04	19 19	24 14	0 14	0 57	1 44
10	17 46	19 01	24 12	0 12	1 01	1 52
20	17 28	18 47	24 11	0 11	1 05	2 01
30	17 07	18 32	24 10	0 10	1 09	2 11
35	16 55	18 26	24 09	0 09	1 11	2 17
40	16 41	18 18	24 08	0 08	1 14	2 24
45	16 24	18 11	24 07	0 07	1 18	2 32
50	16 04	18 03	24 05	0 05	1 21	2 42
52	15 54	18 00	24 05	0 05	1 23	2 46
54	15 43	17 56	24 04	0 04	1 25	2 51
56	15 30	17 52	24 03	0 03	1 27	2 56
58	15 16	17 48	24 02	0 02	1 30	3 03
60	14 59	17 44	24 01	0 01	1 33	3 10
S						

GCT	Equation of Time (App.—Mean) 12	13	14
h	m s	m s	m s
0	+ 0 32.0	+ 0 19.8	+ 0 07.4
6	+ 0 29.0	+ 0 16.7	+ 0 04.3
12	+ 0 25.9	+ 0 13.6	+ 0 01.2
18	+ 0 22.9	+ 0 10.5	− 0 02.0
24	+ 0 19.8	+ 0 07.4	− 0 05.1

GCT of Transit Meridian of Greenwich

DAY	Moon	Venus	Mars	Jupiter	Saturn
	h m	h m	h m	h m	h m
12	18 03	15 14	11 36	7 19	18 27
13	18 47	15 14	11 35	7 16	18 23
14	19 33	15 15	11 34	7 12	18 19
15	20 22	15 15	11 33	7 09	18 15

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb	Venus	Mars
°	′	′	′
0	0.1	0.2	0.1
30	0.1	0.1	0.0
45	0.1	0.1	0.0
60	0.1	0.1	0.0
75	0.1	0.0	0.0
90			

Moon's Lower Limb
Add

Alt.	12	13	14
°	′	′	′
0	14.8	15.8	17.1
4	14.8	15.8	17.1
8	14.8	15.8	17.1
12	14.8	15.8	17.0
16	14.8	15.8	17.0
20	14.8	15.8	17.0
24	14.8	15.8	17.0
28	14.9	15.8	16.9
32	14.9	15.8	16.9
36	14.9	15.8	16.8
40	14.9	15.8	16.8
44	15.0	15.7	16.7
48	15.0	15.7	16.6
52	15.0	15.7	16.6
56	15.1	15.7	16.5
60	15.1	15.7	16.4
64	15.1	15.7	16.4
68	15.2	15.7	16.3
72	15.2	15.7	16.2
76	15.3	15.6	16.1
80	15.3	15.6	16.0
84	15.3	15.6	16.0
88	15.4	15.6	15.9
90			

Add to table, back cover

Moon's Upper Limb
Subtract

Alt.	12	13	14
°	′	′	′
0	16.0	15.4	14.7
4	16.0	15.4	14.7
8	16.0	15.4	14.7
12	16.0	15.4	14.7
16	16.0	15.4	14.7
20	15.9	15.4	14.8
24	15.9	15.4	14.8
28	15.9	15.4	14.8
32	15.9	15.4	14.9
36	15.9	15.4	14.9
40	15.8	15.5	15.0
44	15.8	15.5	15.0
48	15.8	15.5	15.1
52	15.7	15.5	15.2
56	15.7	15.5	15.2
60	15.7	15.5	15.3
64	15.6	15.5	15.4
68	15.6	15.5	15.5
72	15.6	15.6	15.5
76	15.5	15.6	15.6
80	15.5	15.6	15.7
84	15.4	15.6	15.8
88	15.4	15.6	15.9
90			

Subtract from table, back cover

First Quarter 12

GCT	♈ GHA	VENUS −3.8 GHA	Dec.	MARS 1.7 GHA	Dec.	JUPITER −1.9 GHA	Dec.	SATURN 1.3 GHA	Dec.	MOON GHA	code	Dec.	code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
0	262 28.2	131 20.8	+20 19.3	186 35.9	+23 15.9	252 29.5	+ 2 57.5	85 24.4	+ 3 49.7	64 42.1	118	−10 48.7	−154
1	277 30.6	146 20.7	18.5	201 36.5	16.1	267 31.6	57.7	100 26.8	49.6	79 12.9	117	11 04.1	−153
2	292 33.1	161 20.6	17.8	216 37.1	16.3	282 33.7	57.8	115 29.2	49.6	93 43.6	116	11 19.4	−152
3	307 35.6	176 20.4	·· 17.0	231 37.7	·· 16.5	297 35.8	·· 57.9	130 31.6	·· 49.6	108 14.2	115	·11 34.6	−153
4	322 38.0	191 20.3	16.2	246 38.3	16.7	312 38.0	58.1	145 34.0	49.5	122 44.7	114	11 49.9	−152
5	337 40.5	206 20.2	15.5	261 38.9	16.9	327 40.1	58.2	160 36.4	49.5	137 15.1	112	12 05.1	−152
6	352 43.0	221 20.0	+20 14.7	276 39.5	+23 17.1	342 42.2	+ 2 58.3	175 38.8	+ 3 49.4	151 45.3	112	−12 20.3	−151
7	7 45.4	236 19.9	13.9	291 40.1	17.3	357 44.4	58.5	190 41.2	49.4	166 15.5	111	12 35.4	−151
8	22 47.9	251 19.8	13.2	306 40.7	17.4	12 46.5	58.6	205 43.6	49.4	180 45.6	109	12 50.5	−150
9	37 50.4	266 19.6	·· 12.4	321 41.3	·· 17.6	27 48.6	·· 58.7	220 46.0	·· 49.3	195 15.5	109	·13 05.5	−150
10	52 52.8	281 19.5	11.6	336 41.9	17.8	42 50.8	58.8	235 48.4	49.3	209 45.4	107	13 20.5	−149
11	67 55.3	296 19.4	10.8	351 42.5	18.0	57 52.9	59.0	250 50.8	49.3	224 15.1	106	13 35.4	−149
12	82 57.8	311 19.3	+20 10.1	6 43.1	+23 18.2	72 55.0	+ 2 59.1	265 53.2	+ 3 49.2	238 44.7	105	−13 50.3	−148
13	98 00.2	326 19.1	09.3	21 43.7	18.4	87 57.2	59.2	280 55.6	49.2	253 14.2	104	14 05.1	−148
14	113 02.7	341 19.0	08.5	36 44.3	18.6	102 59.3	59.4	295 58.0	49.2	267 43.6	103	14 19.9	−147
15	128 05.1	356 18.9	·· 07.7	51 44.9	·· 18.8	118 01.4	·· 59.5	311 00.4	·· 49.1	282 12.9	101	·14 34.6	−147
16	143 07.6	11 18.8	07.0	66 45.5	18.9	133 03.6	59.6	326 02.8	49.1	296 42.0	100	14 49.3	−146
17	158 10.1	26 18.7	06.2	81 46.1	19.1	148 05.7	59.8	341 05.2	49.0	311 11.0	99	15 03.9	−145
18	173 12.5	41 18.5	+20 05.4	96 46.7	+23 19.3	163 07.8	+ 2 59.9	356 07.6	+ 3 49.0	325 39.9	98	−15 18.4	−145
19	188 15.0	56 18.4	04.6	111 47.3	19.5	178 10.0	3 00.0	11 10.0	49.0	340 08.7	97	15 32.9	−144
20	203 17.5	71 18.3	03.9	126 47.9	19.7	193 12.1	00.1	26 12.4	48.9	354 37.4	95	15 47.3	−144
21	218 19.9	86 18.2	·· 03.1	141 48.5	·· 19.9	208 14.2	·· 00.3	41 14.8	·· 48.9	9 05.9	94	·16 01.7	−142
22	233 22.4	101 18.1	02.3	156 49.1	20.0	223 16.4	00.4	56 17.2	48.8	23 34.3	93	16 15.9	−142
23	248 24.9	116 18.0	01.5	171 49.7	20.2	238 18.5	00.5	71 19.6	48.8	38 02.6	91	16 30.1	−142
0	263 27.3	131 17.8	+20 00.7	186 50.3	+23 20.4	253 20.7	+ 3 00.7	86 22.0	+ 3 48.8	52 30.7	90	−16 44.3	−140
1	278 29.8	146 17.7	20 00.0	201 50.9	20.6	268 22.8	00.8	101 24.4	48.7	66 58.7	89	16 58.3	−140
2	293 32.3	161 17.6	19 59.2	216 51.5	20.8	283 24.9	00.9	116 26.8	48.7	81 26.6	87	17 12.3	−139
3	308 34.7	176 17.5	·· 58.4	231 52.1	·· 21.0	298 27.1	·· 01.0	131 29.2	·· 48.7	95 54.3	87	·17 26.2	−138
4	323 37.2	191 17.4	57.6	246 52.7	21.1	313 29.2	01.2	146 31.6	48.6	110 22.0	84	17 40.0	−137
5	338 39.6	206 17.3	56.8	261 53.3	21.3	328 31.3	01.3	161 34.0	48.6	124 49.4	84	17 53.7	−136
6	353 42.1	221 17.2	+19 56.0	276 53.9	+23 21.5	343 33.5	+ 3 01.4	176 36.4	+ 3 48.5	139 16.8	82	−18 07.3	−136
7	8 44.6	236 17.1	55.2	291 54.5	21.7	358 35.6	01.6	191 38.8	48.5	153 44.0	81	18 20.9	−134
8	23 47.0	251 17.0	54.5	306 55.1	21.9	13 37.7	01.7	206 41.2	48.5	168 11.1	79	18 34.3	−134
9	38 49.5	266 16.9	·· 53.7	321 55.7	·· 22.0	28 39.9	·· 01.8	221 43.6	·· 48.4	182 38.0	78	·18 47.7	−132
10	53 52.0	281 16.8	52.9	336 56.3	22.2	43 42.0	01.9	236 46.0	48.4	197 04.8	77	19 00.9	−132
11	68 54.4	296 16.7	52.1	351 56.9	22.4	58 44.2	02.1	251 48.4	48.4	211 31.5	75	19 14.1	−131
12	83 56.9	311 16.6	+19 51.3	6 57.5	+23 22.6	73 46.3	+ 3 02.2	266 50.8	+ 3 48.3	225 58.0	74	−19 27.2	−129
13	98 59.4	326 16.5	50.5	21 58.1	22.7	88 48.4	02.3	281 53.2	48.3	240 24.4	72	19 40.1	−129
14	114 01.8	341 16.4	49.7	36 58.7	22.9	103 50.6	02.5	296 55.6	48.2	254 50.6	71	19 53.0	−127
15	129 04.3	356 16.3	·· 48.9	51 59.3	·· 23.1	118 52.7	·· 02.6	311 58.0	·· 48.2	269 16.7	70	·20 05.7	−127
16	144 06.7	11 16.2	48.1	66 59.9	23.3	133 54.9	02.7	327 00.4	48.2	283 42.7	68	20 18.4	−125
17	159 09.2	26 16.1	47.4	82 00.5	23.5	148 57.0	02.8	342 02.8	48.1	298 08.5	66	20 30.9	−124
18	174 11.7	41 16.0	+19 46.6	97 01.1	+23 23.6	163 59.1	+ 3 03.0	357 05.2	+ 3 48.1	312 34.1	66	−20 43.3	−123
19	189 14.1	56 15.9	45.8	112 01.7	23.8	179 01.3	03.1	12 07.6	48.0	326 59.7	64	20 55.6	−122
20	204 16.6	71 15.8	45.0	127 02.3	24.0	194 03.4	03.2	27 10.0	48.0	341 25.1	62	21 07.8	−120
21	219 19.1	86 15.7	·· 44.2	142 02.9	·· 24.2	209 05.6	·· 03.3	42 12.4	·· 48.0	355 50.3	61	·21 19.8	−120
22	234 21.5	101 15.7	43.4	157 03.5	24.3	224 07.7	03.5	57 14.8	47.9	10 15.4	59	21 31.8	−118
23	249 24.0	116 15.6	42.6	172 04.1	24.5	239 09.8	03.6	72 17.1	47.9	24 40.3	58	21 43.6	−116
0	264 26.5	131 15.5	+19 41.8	187 04.7	+23 24.7	254 12.0	+ 3 03.7	87 19.5	+ 3 47.8	39 05.1	57	−21 55.2	−116
1	279 28.9	146 15.4	41.0	202 05.3	24.8	269 14.1	03.9	102 21.9	47.8	53 29.8	55	22 06.8	−114
2	294 31.4	161 15.3	40.2	217 05.9	25.0	284 16.3	04.0	117 24.3	47.8	67 54.3	54	22 18.2	−113
3	309 33.9	176 15.2	·· 39.4	232 06.5	·· 25.2	299 18.4	·· 04.1	132 26.7	·· 47.7	82 18.7	52	·22 29.5	−111
4	324 36.3	191 15.1	38.6	247 07.1	25.4	314 20.5	04.2	147 29.1	47.7	96 42.9	51	22 40.6	−110
5	339 38.8	206 15.1	37.8	262 07.7	25.5	329 22.7	04.4	162 31.5	47.6	111 07.0	50	22 51.6	−108
6	354 41.2	221 15.0	+19 37.0	277 08.3	+23 25.7	344 24.8	+ 3 04.5	177 33.9	+ 3 47.6	125 31.0	48	−23 02.4	−107
7	9 43.7	236 14.9	36.2	292 08.9	25.9	359 27.0	04.6	192 36.3	47.6	139 54.8	46	23 13.1	−106
8	24 46.2	251 14.8	35.4	307 09.5	26.0	14 29.1	04.7	207 38.7	47.5	154 18.4	46	23 23.7	−104
9	39 48.6	266 14.8	·· 34.6	322 10.1	·· 26.2	29 31.3	·· 04.9	222 41.1	·· 47.5	168 42.0	44	·23 34.1	−103
10	54 51.1	281 14.7	33.8	337 10.7	26.4	44 33.4	05.0	237 43.5	47.4	183 05.4	42	23 44.4	−101
11	69 53.6	296 14.6	33.0	352 11.3	26.6	59 35.5	05.1	252 45.9	47.4	197 28.6	41	23 54.5	− 99
12	84 56.0	311 14.5	+19 32.2	7 11.9	+23 26.7	74 37.7	+ 3 05.2	267 48.3	+ 3 47.4	211 51.7	40	−24 04.4	− 98
13	99 58.5	326 14.5	31.4	22 12.5	26.9	89 39.8	05.4	282 50.7	47.3	226 14.7	38	24 14.2	− 96
14	115 01.0	341 14.4	30.6	37 13.1	27.1	104 42.0	05.5	297 53.1	47.3	240 37.5	37	24 23.8	− 95
15	130 03.4	356 14.3	·· 29.8	52 13.7	·· 27.2	119 44.1	·· 05.6	312 55.4	·· 47.2	255 00.2	36	·24 33.3	− 93
16	145 05.9	11 14.2	29.0	67 14.2	27.4	134 46.3	05.7	327 57.8	47.2	269 22.8	34	24 42.6	− 91
17	160 08.4	26 14.2	28.1	82 14.8	27.6	149 48.4	05.9	343 00.2	47.2	283 45.2	33	24 51.7	− 90
18	175 10.8	41 14.1	+19 27.3	97 15.4	+23 27.7	164 50.6	+ 3 06.0	358 02.6	+ 3 47.1	298 07.5	31	−25 00.7	− 87
19	190 13.3	56 14.0	26.5	112 16.0	27.9	179 52.7	06.1	13 05.0	47.1	312 29.6	31	25 09.4	− 86
20	205 15.7	71 14.0	25.7	127 16.6	28.1	194 54.8	06.2	28 07.4	47.0	326 51.7	29	25 18.0	− 85
21	220 18.2	86 13.9	·· 24.9	142 17.2	·· 28.2	209 57.0	·· 06.4	43 09.8	·· 47.0	341 13.6	28	·25 26.5	− 82
22	235 20.7	101 13.9	24.1	157 17.8	28.4	224 59.1	06.5	58 12.2	47.0	355 35.4	26	25 34.7	− 81
23	250 23.1	116 13.8	23.3	172 18.4	28.6	240 01.3	06.6	73 14.6	46.9	9 57.0	26	25 42.8	− 78
24	265 25.6	131 13.7	+19 22.5	187 19.0	+23 28.7	255 03.4	+ 3 06.7	88 17.0	+ 3 46.9	24 18.6	24	−25 50.6	− 77
code	—	− 1	− 8	+ 6	+ 1	+ 21	+ 1	+ 24	0				

GCT	SUN GHA	SUN Dec.
h	° ′	° ′
0	179 58.7	+23 16.1
1	194 58.5	16.2
2	209 58.4	16.3
3	224 58.3 ··	16.5
4	239 58.1	16.6
5	254 58.0	16.7
6	269 57.9	+23 16.8
7	284 57.7	16.9
8	299 57.6	17.1
9	314 57.5 ··	17.2
10	329 57.3	17.3
11	344 57.2	17.4
12	359 57.1	+23 17.5
13	14 56.9	17.7
14	29 56.8	17.8
15	44 56.7 ··	17.9
16	59 56.6	18.0
17	74 56.4	18.1
18	89 56.3	+23 18.2
19	104 56.2	18.3
20	119 56.0	18.4
21	134 55.9 ··	18.5
22	149 55.8	18.7
23	164 55.6	18.8
0	179 55.5	+23 18.9
1	194 55.4	19.0
2	209 55.2	19.1
3	224 55.1 ··	19.2
4	239 55.0	19.3
5	254 54.8	19.4
6	269 54.7	+23 19.5
7	284 54.6	19.6
8	299 54.4	19.7
9	314 54.3 ··	19.8
10	329 54.2	19.9
11	344 54.0	20.0
12	359 53.9	+23 20.1
13	14 53.8	20.2
14	29 53.6	20.3
15	44 53.5 ··	20.4
16	59 53.4	20.5
17	74 53.2	20.6
18	89 53.1	+23 20.7
19	104 53.0	20.8
20	119 52.8	20.9
21	134 52.7 ··	21.0
22	149 52.6	21.1
23	164 52.4	21.1
0	179 52.3	+23 21.2
1	194 52.2	21.3
2	209 52.0	21.4
3	224 51.9 ··	21.5
4	239 51.8	21.6
5	254 51.6	21.7
6	269 51.5	+23 21.8
7	284 51.4	21.8
8	299 51.2	21.9
9	314 51.1 ··	22.0
10	329 51.0	22.1
11	344 50.8	22.2
12	359 50.7	+23 22.3
13	14 50.6	22.3
14	29 50.4	22.4
15	44 50.3 ··	22.5
16	59 50.2	22.6
17	74 50.0	22.7
18	89 49.9	+23 22.7
19	104 49.8	22.8
20	119 49.6	22.9
21	134 49.5 ··	23.0
22	149 49.4	23.0
23	164 49.2	23.1
24	179 49.1	+23 23.2
code	−	+ 1

No.	STARS SHA	STARS Dec.	Transit Mer. Gr.
	° ′	° ′	h m
1	358 32.0	+28 49.2	6 31
2	358 21.6	+58 52.7	6 32
3	349 42.7	−18 15.0	7 06
4	339 21.1	+59 58.8	7 47
5	336 01.4	−57 28.6	8 01
6	332 50.7	+89 02.0	8 14
7	328 53.7	+23 14.0	8 29
8	315 53.9	−40 29.6	9 21
9	309 47.8	+49 41.4	9 45
10	291 43.3	+16 24.9	10 57
11	281 57.2	− 8 15.2	11 36
12	281 43.9	+45 57.2	11 37
13	279 22.4	+ 6 18.6	11 47
14	279 12.0	+28 34.2	11 47
15	276 34.0	− 1 13.8	11 58
16	271 52.1	+ 7 24.1	12 17
17	264 17.4	−52 40.0	12 47
18	259 15.2	−16 38.8	13 07
19	255 49.6	−28 54.2	13 21
20	245 48.8	+ 5 21.2	14 01
21	244 25.0	+28 08.9	14 06
22	234 37.8	−59 21.3	14 45
23	223 27.2	−43 14.3	15 30
24	221 50.7	−69 31.2	15 36
25	218 42.1	− 8 26.8	15 49
26	208 33.2	+12 12.4	16 29
27	194 48.6	+62 01.1	17 24
28	183 21.1	+14 50.7	18 10
29	174 01.8	−62 50.2	18 47
30	172 53.1	−56 50.8	18 52
31	168 46.9	−59 25.8	19 08
32	167 01.1	+56 13.6	19 15
33	159 29.9	+55 10.9	19 45
34	159 20.3	−10 54.7	19 46
35	153 35.1	+49 33.4	20 09
36	149 02.5	−36 08.2	20 27
37	146 38.0	+19 26.0	20 36
38	140 55.4	−60 38.6	20 59
39	137 16.4	+74 21.3	21 14
40	126 50.1	+26 52.6	21 55
41	120 37.7	−22 29.3	22 20
42	113 23.2	−26 19.8	22 49
43	109 06.5	−68 56.7	23 06
44	103 05.7	−15 40.2	23 30
45	97 24.9	−37 04.4	23 53
46	96 49.4	+12 35.5	23 55
47	91 07.3	+51 29.5	0 22
48	84 45.2	−34 24.7	0 47
49	81 10.1	+38 44.1	1 01
50	76 55.7	−26 21.6	1 18
51	62 53.4	+ 8 44.2	2 14
52	54 32.0	−56 53.5	2 48
53	50 03.1	+45 06.1	3 05
54	34 32.8	+ 9 39.0	4 07
55	28 41.8	−47 11.6	4 31
56	16 15.2	−29 52.7	5 20
57	14 24.8	+14 56.5	5 28

Lat.	Sunrise	Twlt. begins	Moonrise 15	16	17	18
N °	h m	h m	h m	h m	h m	h m
70	□	□	17 32	■	■	■
68	□	□	17 05	20 16	■	■
66	□	□	16 45	19 14	■	■
64	1 33	////	16 29	18 39	21 38	■
62	2 10	////	16 15	18 15	20 30	■
60	2 36	////	16 04	17 55	19 55	21 50
58	2 56	////	15 54	17 39	19 29	21 13
56	3 13	////	15 46	17 25	19 09	20 46
54	3 27	////	15 39	17 14	18 52	20 25
52	3 39	////	15 32	17 03	18 38	20 07
50	3 50	////	15 26	16 54	18 26	19 52
45	4 13	1 41	15 13	16 35	18 00	19 22
40	4 30	2 27	15 03	16 20	17 40	18 59
35	4 45	2 58	14 54	16 07	17 23	18 39
30	4 58	3 22	14 46	15 55	17 08	18 23
20	5 20	3 56	14 32	15 36	16 44	17 55
10	5 39	4 21	14 21	15 19	16 23	17 31
0	5 57	4 42	14 10	15 04	16 03	17 09
10	6 14	4 59	13 59	14 48	15 44	16 47
20	6 33	5 13	13 48	14 32	15 23	16 23
30	6 54	5 29	13 35	14 14	15 00	15 56
35	7 06	5 35	13 28	14 03	14 46	15 40
40	7 20	5 42	13 20	13 51	14 30	15 21
45	7 37	5 50	13 10	13 36	14 11	14 58
50	7 57	5 58	12 59	13 19	13 48	14 30
52	8 07	6 01	12 53	13 11	13 37	14 16
54	8 18	6 05	12 47	13 02	13 24	14 00
56	8 31	6 09	12 41	12 52	13 09	13 41
58	8 46	6 12	12 34	12 40	12 53	13 18
60	9 03	6 17	12 25	12 27	12 32	12 48
S						

Lat.	Sunset	Twlt. ends	Moonset 15	16	17	18
N °	h m	h m	h m	h m	h m	h m
70	□	□	22 47	■	■	■
68	□	□	23 16	22 00	■	■
66	□	□	23 38	23 03	■	■
64	22 29	////	{0 07 / 23 56}	23 39	22 45	■
62	21 52	////	0 16	0 10	{0 05 / 23 56}	■
60	21 25	////	0 23	0 23	0 25	0 32
58	21 05	////	0 29	0 34	0 42	0 58
56	20 48	////	0 34	0 43	0 56	1 19
54	20 34	////	0 39	0 51	1 09	1 36
52	20 22	////	0 44	0 59	1 20	1 51
50	20 11	////	0 48	1 06	1 29	2 04
45	19 49	22 22	0 57	1 20	1 50	2 30
40	19 31	21 34	1 05	1 33	2 07	2 51
35	19 16	21 03	1 11	1 43	2 21	3 09
30	19 03	20 40	1 17	1 52	2 34	3 24
20	18 41	20 05	1 27	2 08	2 55	3 50
10	18 22	19 40	1 36	2 22	3 14	4 13
0	18 04	19 19	1 44	2 35	3 31	4 34
10	17 47	19 02	1 52	2 48	3 49	4 55
20	17 28	18 47	2 01	3 02	4 08	5 17
30	17 07	18 32	2 11	3 18	4 30	5 44
35	16 55	18 26	2 17	3 28	4 42	5 59
40	16 41	18 19	2 24	3 39	4 57	6 17
45	16 24	18 11	2 32	3 51	5 15	6 39
50	16 03	18 02	2 42	4 07	5 37	7 07
52	15 53	17 59	2 46	4 14	5 48	7 20
54	15 42	17 55	2 51	4 23	6 00	7 36
56	15 30	17 52	2 56	4 32	6 14	7 55
58	15 15	17 48	3 03	4 42	6 30	8 18
60	14 58	17 44	3 10	4 55	6 49	8 48
S						

GCT	Equation of Time (App.—Mean) 15	16	17
h	m s	m s	m s
0	− 0 05.1	− 0 17.7	− 0 30.5
6	− 0 08.3	− 0 20.9	− 0 33.7
12	− 0 11.4	− 0 24.1	− 0 36.9
18	− 0 14.6	− 0 27.3	− 0 40.1
24	− 0 17.7	− 0 30.5	− 0 43.3

GCT of Transit Meridian of Greenwich DAY	Moon	Venus	Mars	Jupiter	Saturn
	h m	h m	h m	h m	h m
15	20 22	15 15	11 33	7 09	18 15
16	21 17	15 15	11 32	7 06	18 12
17	22 18	15 15	11 31	7 02	18 08
18	23 25	15 15	11 30	6 59	18 04

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb	Venus	Mars
°	′	′	′
0			
	0.1	0.2	0.1
30			
	0.1	0.1	0.0
45			
	0.1	0.1	0.0
60			
	0.1	0.1	0.0
75			
	0.1	0.0	0.0
90			

Moon's Lower Limb
Add

Alt.	15	16	17
°	′	′	′
0			
	18.2	19.4	20.4
4			
	18.2	19.4	20.4
8			
	18.2	19.3	20.3
12			
	18.2	19.3	20.3
16			
	18.1	19.2	20.2
20			
	18.1	19.2	20.1
24			
	18.0	19.1	20.0
28			
	17.9	19.0	19.9
32			
	17.9	18.9	19.7
36			
	17.8	18.7	19.6
40			
	17.7	18.6	19.4
44			
	17.6	18.5	19.2
48			
	17.5	18.3	19.0
52			
	17.4	18.1	18.8
56			
	17.2	18.0	18.6
60			
	17.1	17.8	18.4
64			
	17.0	17.6	18.1
68			
	16.8	17.4	17.9
72			
	16.7	17.2	17.6
76			
	16.6	17.0	17.4
80			
	16.4	16.8	17.1
84			
	16.3	16.6	16.9
88			
	16.2	16.4	16.7
90			

Add to table, back cover

Moon's Upper Limb
Subtract

Alt.	15	16	17
°	′	′	′
0			
	14.0	13.4	12.8
4			
	14.0	13.4	12.8
8			
	14.1	13.4	12.8
12			
	14.1	13.5	12.9
16			
	14.1	13.5	13.0
20			
	14.2	13.6	13.1
24			
	14.2	13.7	13.2
28			
	14.3	13.8	13.3
32			
	14.4	13.9	13.4
36			
	14.5	14.0	13.6
40			
	14.6	14.1	13.8
44			
	14.7	14.3	13.9
48			
	14.8	14.4	14.1
52			
	14.9	14.6	14.3
56			
	15.0	14.8	14.6
60			
	15.1	15.0	14.8
64			
	15.3	15.1	15.0
68			
	15.4	15.3	15.3
72			
	15.5	15.5	15.5
76			
	15.7	15.7	15.8
80			
	15.8	15.9	16.1
84			
	16.0	16.2	16.3
88			
	16.1	16.3	16.5
90			

Subtract from table, back cover

GCT	♈ GHA	VENUS −3.9 GHA	VENUS Dec.	MARS 1.7 GHA	MARS Dec.	JUPITER −1.9 GHA	JUPITER Dec.	SATURN 1.3 GHA	SATURN Dec.	MOON GHA	code	MOON Dec.	code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
0	265 25.6	131 13.7	+19 22.5	187 19.0	+23 28.7	255 03.4	+ 3 06.7	88 17.0	+ 3 46.9	24 18.6	24	−25 50.6	− 77
1	280 28.1	146 13.7	21.7	202 19.6	28.9	270 05.6	06.9	103 19.4	46.8	38 40.0	23	25 58.3	− 75
2	295 30.5	161 13.6	20.9	217 20.2	29.1	285 07.7	07.0	118 21.7	46.8	53 01.3	22	26 05.8	− 73
3	310 33.0	176 13.6	·· 20.0	232 20.8	·· 29.2	300 09.9	·· 07.1	133 24.1	·· 46.7	67 22.5	20	·26 13.1	− 72
4	325 35.5	191 13.5	19.2	247 21.4	29.4	315 12.0	07.2	148 26.5	46.7	81 43.5	20	26 20.3	− 69
5	340 37.9	206 13.5	18.4	262 22.0	29.5	330 14.2	07.4	163 28.9	46.7	96 04.5	19	26 27.2	− 67
6	355 40.4	221 13.4	+19 17.6	277 22.6	+23 29.7	345 16.3	+ 3 07.5	178 31.3	+ 3 46.6	110 25.4	17	−26 33.9	− 66
7	10 42.9	236 13.3	16.8	292 23.2	29.9	0 18.4	07.6	193 33.7	46.6	124 46.1	16	26 40.5	− 63
8	25 45.3	251 13.3	16.0	307 23.8	30.0	15 20.6	07.7	208 36.1	46.5	139 06.7	16	26 46.8	− 61
9	40 47.8	266 13.2	·· 15.1	322 24.4	·· 30.2	30 22.7	·· 07.9	223 38.5	·· 46.5	153 27.3	14	·26 52.9	− 59
10	55 50.2	281 13.2	14.3	337 25.0	30.3	45 24.9	08.0	238 40.9	46.5	167 47.7	14	26 58.8	− 58
11	70 52.7	296 13.1	13.5	352 25.6	30.5	60 27.0	08.1	253 43.3	46.4	182 08.1	12	27 04.6	− 55
12	85 55.2	311 13.1	+19 12.7	7 26.2	+23 30.7	75 29.2	+ 3 08.2	268 45.6	+ 3 46.4	196 28.3	12	−27 10.1	− 53
13	100 57.6	326 13.1	11.9	22 26.8	30.8	90 31.3	08.4	283 48.0	46.3	210 48.5	11	27 15.4	− 51
14	116 00.1	341 13.0	11.1	37 27.4	31.0	105 33.5	08.5	298 50.4	46.3	225 08.6	10	27 20.5	− 49
15	131 02.6	356 13.0	·· 10.2	52 28.0	·· 31.1	120 35.6	·· 08.6	313 52.8	·· 46.2	239 28.6	9	·27 25.4	− 46
16	146 05.0	11 12.9	09.4	67 28.6	31.3	135 37.8	08.7	328 55.2	46.2	253 48.5	8	27 30.0	− 45
17	161 07.5	26 12.9	08.6	82 29.2	31.5	150 39.9	08.8	343 57.6	46.2	268 08.3	8	27 34.5	− 42
18	176 10.0	41 12.8	+19 07.8	97 29.8	+23 31.6	165 42.1	+ 3 09.0	359 00.0	+ 3 46.1	282 28.1	6	−27 38.7	− 40
19	191 12.4	56 12.8	06.9	112 30.4	31.8	180 44.2	09.1	14 02.4	46.1	296 47.7	7	27 42.7	− 38
20	206 14.9	71 12.8	06.1	127 31.0	31.9	195 46.4	09.2	29 04.8	46.0	311 07.4	5	27 46.5	− 36
21	221 17.4	86 12.7	·· 05.3	142 31.6	·· 32.1	210 48.5	·· 09.3	44 07.1	·· 46.0	325 26.9	5	·27 50.1	− 34
22	236 19.8	101 12.7	04.5	157 32.2	32.2	225 50.7	09.5	59 09.5	45.9	339 46.4	5	27 53.5	− 31
23	251 22.3	116 12.7	03.6	172 32.8	32.4	240 52.8	09.6	74 11.9	45.9	354 05.9	3	27 56.6	− 29
0	266 24.7	131 12.6	+19 02.8	187 33.4	+23 32.6	255 55.0	+ 3 09.7	89 14.3	+ 3 45.9	8 25.2	4	−27 59.5	− 27
1	281 27.2	146 12.6	02.0	202 34.0	32.7	270 57.1	09.8	104 16.7	45.8	22 44.6	3	28 02.2	− 25
2	296 29.7	161 12.6	01.2	217 34.6	32.9	285 59.3	09.9	119 19.1	45.8	37 03.9	2	28 04.7	− 23
3	311 32.1	176 12.5	·19 00.3	232 35.2	·· 33.0	301 01.4	·· 10.1	134 21.5	·· 45.7	51 23.1	2	·28 07.0	− 20
4	326 34.6	191 12.5	18 59.5	247 35.8	33.2	316 03.6	10.2	149 23.8	45.7	65 42.3	2	28 09.0	− 18
5	341 37.1	206 12.5	58.7	262 36.4	33.3	331 05.7	10.3	164 26.2	45.6	80 01.5	2	28 10.8	− 15
6	356 39.5	221 12.4	+18 57.9	277 37.0	+23 33.5	346 07.9	+ 3 10.4	179 28.6	+ 3 45.6	94 20.7	1	−28 12.3	− 14
7	11 42.0	236 12.4	57.0	292 37.6	33.6	1 10.1	10.6	194 31.0	45.6	108 39.8	1	28 13.7	− 11
8	26 44.5	251 12.4	56.2	307 38.2	33.8	16 12.2	10.7	209 33.4	45.5	122 58.9	1	28 14.8	− 9
9	41 46.9	266 12.4	·· 55.4	322 38.8	·· 33.9	31 14.4	·· 10.8	224 35.8	·· 45.5	137 18.0	0	·28 15.7	− 6
10	56 49.4	281 12.3	54.5	337 39.4	34.1	46 16.5	10.9	239 38.2	45.4	151 37.0	1	28 16.3	− 4
11	71 51.8	296 12.3	53.7	352 40.0	34.2	61 18.7	11.0	254 40.6	45.4	165 56.1	0	28 16.7	− 2
12	86 54.3	311 12.3	+18 52.9	7 40.6	+23 34.4	76 20.8	+ 3 11.2	269 42.9	+ 3 45.3	180 15.1	1	−28 16.9	0
13	101 56.8	326 12.3	52.0	22 41.2	34.5	91 23.0	11.3	284 45.3	45.3	194 34.2	0	28 16.9	+ 3
14	116 59.2	341 12.3	51.2	37 41.8	34.7	106 25.1	11.4	299 47.7	45.3	208 53.2	1	28 16.6	+ 5
15	132 01.7	356 12.3	·· 50.4	52 42.4	·· 34.8	121 27.3	·· 11.5	314 50.1	·· 45.2	223 12.3	1	·28 16.1	+ 7
16	147 04.2	11 12.2	49.5	67 43.0	35.0	136 29.4	11.6	329 52.5	45.2	237 31.4	0	28 15.4	+ 9
17	162 06.6	26 12.2	48.7	82 43.6	35.1	151 31.6	11.8	344 54.9	45.1	251 50.4	1	28 14.5	+ 12
18	177 09.1	41 12.2	+18 47.9	97 44.2	+23 35.3	166 33.7	+ 3 11.9	359 57.2	+ 3 45.1	266 09.5	2	−28 13.3	+ 14
19	192 11.6	56 12.2	47.0	112 44.8	35.4	181 35.9	12.0	14 59.6	45.0	280 28.7	1	28 11.9	+ 17
20	207 14.0	71 12.2	46.2	127 45.4	35.6	196 38.1	12.1	30 02.0	45.0	294 47.8	2	28 10.2	+ 18
21	222 16.5	86 12.2	·· 45.3	142 46.0	·· 35.7	211 40.2	·· 12.2	45 04.4	·· 44.9	309 07.0	2	·28 08.4	+ 21
22	237 19.0	101 12.2	44.5	157 46.6	35.9	226 42.4	12.4	60 06.8	44.9	323 26.2	2	28 06.3	+ 23
23	252 21.4	116 12.2	43.7	172 47.2	36.0	241 44.5	12.5	75 09.2	44.9	337 45.4	3	28 04.0	+ 26
0	267 23.9	131 12.2	+18 42.8	187 47.8	+23 36.2	256 46.7	+ 3 12.6	90 11.6	+ 3 44.8	352 04.7	3	−28 01.4	+ 27
1	282 26.3	146 12.1	42.0	202 48.4	36.3	271 48.8	12.7	105 13.9	44.8	6 24.0	4	27 58.7	+ 30
2	297 28.8	161 12.1	41.1	217 49.0	36.5	286 51.0	12.8	120 16.3	44.7	20 43.4	4	27 55.7	+ 32
3	312 31.3	176 12.1	·· 40.3	232 49.6	·· 36.6	301 53.2	·· 13.0	135 18.7	·· 44.7	35 02.8	5	·27 52.5	+ 35
4	327 33.7	191 12.1	39.5	247 50.2	36.8	316 55.3	13.1	150 21.1	44.6	49 22.3	6	27 49.0	+ 36
5	342 36.2	206 12.1	38.6	262 50.8	36.9	331 57.5	13.2	165 23.5	44.6	63 41.9	6	27 45.4	+ 39
6	357 38.7	221 12.1	+18 37.8	277 51.4	+23 37.1	346 59.6	+ 3 13.3	180 25.8	+ 3 44.5	78 01.5	7	−27 41.5	+ 41
7	12 41.1	236 12.1	36.9	292 52.0	37.2	2 01.8	13.4	195 28.2	44.5	92 21.2	7	27 37.4	+ 43
8	27 43.6	251 12.1	36.1	307 52.6	37.3	17 03.9	13.6	210 30.6	44.5	106 40.9	8	27 33.1	+ 45
9	42 46.1	266 12.1	·· 35.2	322 53.2	·· 37.5	32 06.1	·· 13.7	225 33.0	·· 44.4	121 00.7	9	·27 28.6	+ 48
10	57 48.5	281 12.1	34.4	337 53.8	37.6	47 08.3	13.8	240 35.4	44.4	135 20.6	10	27 23.8	+ 49
11	72 51.0	296 12.1	33.6	352 54.4	37.8	62 10.4	13.9	255 37.8	44.3	149 40.6	10	27 18.9	+ 52
12	87 53.5	311 12.2	+18 32.7	7 55.0	+23 37.9	77 12.6	+ 3 14.0	270 40.1	+ 3 44.3	164 00.6	12	−27 13.7	+ 54
13	102 55.9	326 12.2	31.9	22 55.6	38.1	92 14.7	14.1	285 42.5	44.2	178 20.8	12	27 08.3	+ 55
14	117 58.4	341 12.2	31.0	37 56.2	38.2	107 16.9	14.3	300 44.9	44.2	192 41.0	14	27 02.8	+ 58
15	133 00.8	356 12.2	·· 30.2	52 56.8	·· 38.3	122 19.1	·· 14.4	315 47.3	·· 44.1	207 01.4	14	·26 57.0	+ 60
16	148 03.3	11 12.2	29.3	67 57.4	38.5	137 21.2	14.5	330 49.7	44.1	221 21.8	15	26 51.0	+ 62
17	163 05.8	26 12.2	28.5	82 58.0	38.6	152 23.4	14.6	345 52.0	44.1	235 42.3	16	26 44.8	+ 64
18	178 08.2	41 12.2	+18 27.6	97 58.6	+23 38.8	167 25.5	+ 3 14.7	0 54.4	+ 3 44.0	250 02.9	17	−26 38.4	+ 66
19	193 10.7	56 12.2	26.8	112 59.2	38.9	182 27.7	14.9	15 56.8	44.0	264 23.6	19	26 31.8	+ 68
20	208 13.2	71 12.2	25.9	127 59.8	39.0	197 29.9	15.0	30 59.2	43.9	278 44.5	19	26 25.0	+ 70
21	223 15.6	86 12.3	·· 25.1	143 00.4	·· 39.2	212 32.0	·· 15.1	46 01.6	·· 43.9	293 05.4	20	·26 18.0	+ 72
22	238 18.1	101 12.3	24.2	158 01.0	39.3	227 34.2	15.2	61 04.0	43.8	307 26.4	22	26 10.8	+ 74
23	253 20.6	116 12.3	23.4	173 01.6	39.4	242 36.3	15.3	76 06.3	43.8	321 47.6	23	26 03.4	+ 76
24	268 23.0	131 12.3	+18 22.5	188 02.2	+23 39.6	257 38.5	+ 3 15.4	91 08.7	+ 3 43.7	336 08.9	24	−25 55.8	+ 78
code	—	0	− 9	+ 6	+ 1	+ 22	+ 1	+ 24	0				

GCT	SUN GHA	Dec.
h	° ′	° ′
0	179 49.1	+23 23.2
1	194 49.0	23.3
2	209 48.8	23.3
3	224 48.7	•• 23.4
4	239 48.6	23.5
5	254 48.4	23.5
6	269 48.3	+23 23.6
7	284 48.2	23.7
8	299 48.0	23.7
9	314 47.9	•• 23.8
10	329 47.8	23.9
11	344 47.6	23.9
12	359 47.5	+23 24.0
13	14 47.4	24.1
14	29 47.2	24.1
15	44 47.1	•• 24.2
16	59 47.0	24.3
17	74 46.8	24.3
18	89 46.7	+23 24.4
19	104 46.6	24.4
20	119 46.4	24.5
21	134 46.3	•• 24.5
22	149 46.2	24.6
23	164 46.0	24.7
0	179 45.9	+23 24.7
1	194 45.8	24.8
2	209 45.6	24.8
3	224 45.5	•• 24.9
4	239 45.4	24.9
5	254 45.2	25.0
6	269 45.1	+23 25.0
7	284 45.0	25.1
8	299 44.8	25.1
9	314 44.7	•• 25.2
10	329 44.5	25.2
11	344 44.4	25.3
12	359 44.3	+23 25.3
13	14 44.1	25.4
14	29 44.0	25.4
15	44 43.9	•• 25.5
16	59 43.7	25.5
17	74 43.6	25.6
18	89 43.5	+23 25.6
19	104 43.3	25.6
20	119 43.2	25.7
21	134 43.1	•• 25.7
22	149 42.9	25.8
23	164 42.8	25.8
0	179 42.7	+23 25.8
1	194 42.5	25.9
2	209 42.4	25.9
3	224 42.3	•• 26.0
4	239 42.1	26.0
5	254 42.0	26.0
6	269 41.9	+23 26.1
7	284 41.7	26.1
8	299 41.6	26.1
9	314 41.5	•• 26.2
10	329 41.3	26.2
11	344 41.2	26.2
12	359 41.0	+23 26.3
13	14 40.9	26.3
14	29 40.8	26.3
15	44 40.6	•• 26.3
16	59 40.5	26.4
17	74 40.4	26.4
18	89 40.2	+23 26.4
19	104 40.1	26.4
20	119 40.0	26.5
21	134 39.8	•• 26.5
22	149 39.7	26.5
23	164 39.6	26.5
24	179 39.4	+23 26.6
code	—	+ 1

STARS No.	SHA	Dec.	Transit Mer. Gr.
	° ′	° ′	h m
1	358 31.9	+28 49.2	6 19
2	358 21.6	+58 52.7	6 20
3	349 42.7	−18 15.0	6 54
4	339 21.1	+59 58.8	7 36
5	336 01.4	−57 28.6	7 49
6	332 49.8	+89 02.0	8 02
7	328 53.7	+23 14.0	8 17
8	315 53.9	−40 29.6	9 09
9	309 47.7	+49 41.4	9 34
10	291 43.3	+16 24.9	10 46
11	281 57.2	− 8 15.2	11 25
12	281 43.9	+45 57.2	11 26
13	279 22.4	+ 6 18.6	11 35
14	279 12.0	+28 34.2	11 36
15	276 34.0	− 1 13.7	11 46
16	271 52.1	+ 7 24.1	12 05
17	264 17.4	−52 40.0	12 35
18	259 15.2	−16 38.8	12 55
19	255 49.6	−28 54.2	13 09
20	245 48.8	+ 5 21.2	13 49
21	244 25.0	+28 08.9	13 54
22	234 37.9	−59 21.2	14 33
23	223 27.2	−43 14.3	15 18
24	221 50.7	−69 31.2	15 24
25	218 42.1	− 8 26.8	15 37
26	208 33.2	+12 12.4	16 17
27	194 48.6	+62 01.1	17 12
28	183 21.1	+14 50.7	17 58
29	174 01.8	−62 50.2	18 35
30	172 53.1	−56 50.8	18 40
31	168 47.0	−59 25.8	18 56
32	167 01.1	+56 13.6	19 03
33	159 29.9	+55 10.9	19 33
34	159 20.3	−10 54.7	19 34
35	153 35.1	+49 33.4	19 57
36	149 02.5	−36 08.2	20 15
37	146 38.0	+19 26.0	20 24
38	140 55.4	−60 38.6	20 47
39	137 16.4	+74 21.4	21 02
40	126 50.1	+26 52.6	21 43
41	120 37.7	−22 29.3	22 08
42	113 23.2	−26 19.8	22 37
43	109 06.5	−68 56.7	22 54
44	103 05.7	−15 40.2	23 18
45	97 24.8	−37 04.4	23 41
46	96 49.4	+12 35.5	23 43
47	91 07.3	+51 29.5	0 10
48	84 45.2	−34 24.7	0 35
49	81 10.1	+38 44.1	0 50
50	76 55.7	−26 21.6	1 06
51	62 53.4	+ 8 44.2	2 02
52	54 32.0	−56 53.5	2 36
53	50 03.0	+45 06.1	2 54
54	34 32.7	+ 9 39.0	3 56
55	28 41.8	−47 11.6	4 19
56	16 15.1	−29 52.6	5 08
57	14 24.8	+14 56.5	5 16

Lat.	Sunrise	Twlt. begins	Moonrise 18	19	20	21
N °	h m	h m	h m	h m	h m	h m
70	▭	▭	▬	▬	▬	▬
68	▭	▭	▬	▬	▬	▬
66	▭	▭	▬	▬	▬	▬
64	1 31	////	▬	▬	▬	1 23
62	2 09	////	▬	▬	▬	{0 04 / 23 56}
60	2 35	////	21 50	23 03	23 28	23 35
58	2 56	////	21 13	22 25	23 01	23 18
56	3 13	////	20 46	21 58	22 40	23 03
54	3 27	////	20 25	21 37	22 23	22 51
52	3 39	////	20 07	21 19	22 08	22 40
50	3 50	////	19 52	21 04	21 55	22 30
45	4 13	1 40	19 22	20 33	21 28	22 09
40	4 31	2 28	18 59	20 09	21 07	21 52
35	4 46	2 59	18 39	19 50	20 49	21 38
30	4 59	3 22	18 23	19 33	20 34	21 25
20	5 21	3 57	17 55	19 04	20 08	21 03
10	5 40	4 22	17 31	18 40	19 45	20 45
0	5 57	4 42	17 09	18 17	19 24	20 27
10	6 15	5 00	16 47	17 54	19 03	20 09
20	6 33	5 14	16 23	17 30	18 41	19 50
30	6 55	5 28	15 56	17 01	18 14	19 28
35	7 07	5 36	15 40	16 45	17 59	19 16
40	7 21	5 43	15 21	16 25	17 40	19 01
45	7 38	5 51	14 58	16 01	17 19	18 43
50	7 59	5 59	14 30	15 31	16 51	18 20
52	8 09	6 02	14 16	15 16	16 37	18 10
54	8 20	6 06	14 00	14 58	16 21	17 58
56	8 33	6 10	13 41	14 37	16 02	17 44
58	8 47	6 14	13 18	14 10	15 39	17 27
60	9 05	6 18	12 48	13 33	15 09	17 08
S						

Lat.	Sunset	Twlt. ends	Moonset 18	19	20	21
N °	h m	h m	h m	h m	h m	h m
70	▭	▭	▬	▬	▬	▬
68	▭	▭	▬	▬	▬	▬
66	▭	▭	▬	▬	▬	▬
64	22 32	////	▬	▬	▬	2 09
62	21 53	////	▬	▬	▬	3 26
60	21 27	////	0 32	0 56	2 07	4 02
58	21 06	////	0 58	1 33	2 45	4 28
56	20 50	////	1 19	2 00	3 12	4 48
54	20 35	////	1 36	2 22	3 33	5 05
52	20 23	////	1 51	2 39	3 50	5 19
50	20 12	////	2 04	2 54	4 05	5 32
45	19 50	22 23	2 30	3 25	4 36	5 58
40	19 32	21 35	2 51	3 49	4 59	6 18
35	19 16	21 03	3 09	4 08	5 19	6 35
30	19 03	20 40	3 24	4 25	5 35	6 50
20	18 41	20 05	3 50	4 54	6 03	7 14
10	18 22	19 40	4 13	5 18	6 27	7 35
0	18 05	19 20	4 34	5 41	6 49	7 55
10	17 48	19 03	4 55	6 04	7 11	8 14
20	17 29	18 48	5 17	6 28	7 35	8 35
30	17 08	18 34	5 44	6 56	8 03	8 59
35	16 55	18 26	5 59	7 13	8 19	9 13
40	16 41	18 19	6 17	7 33	8 37	9 29
45	16 24	18 11	6 39	7 57	9 00	9 48
50	16 04	18 04	7 07	8 27	9 29	10 11
52	15 54	18 00	7 20	8 42	9 42	10 22
54	15 43	17 57	7 36	9 00	9 59	10 35
56	15 30	17 52	7 55	9 21	10 18	10 50
58	15 15	17 48	8 18	9 47	10 41	11 07
60	14 58	17 44	8 48	10 25	11 11	11 27
S						

GCT	Equation of Time (App.—Mean) 18	19	20
h	m s	m s	m s
0	− 0 43.3	− 0 56.2	− 1 09.1
6	− 0 46.5	− 0 59.4	− 1 12.3
12	− 0 49.7	− 1 02.6	− 1 15.5
18	− 0 52.9	− 1 05.8	− 1 18.8
24	− 0 56.2	− 1 09.1	− 1 22.0

GCT of Transit Meridian of Greenwich

DAY	Moon	Venus	Mars	Jupiter	Saturn
	h m	h m	h m	h m	h m
18	23 25	15 15	11 30	6 59	18 04
19	24 33	15 15	11 29	6 55	18 00
20	0 33	15 15	11 28	6 52	17 56
21	1 40	15 15	11 27	6 49	17 53

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb	Venus	Mars
°	′	′	′
0			
	0.1	0.2	0.1
30			
	0.1	0.1	0.0
45			
	0.1	0.1	0.0
60			
	0.1	0.1	0.0
75			
	0.1	0.0	0.0
90			

Moon's Lower Limb
Add

Alt.	18	19	20
°	′	′	′
0			
	20.9	21.1	21.0
4			
	20.9	21.1	21.0
8			
	20.8	21.1	21.0
12			
	20.8	21.0	20.9
16			
	20.7	20.9	20.8
20			
	20.6	20.8	20.7
24			
	20.5	20.7	20.6
28			
	20.3	20.6	20.4
32			
	20.2	20.4	20.3
36			
	20.0	20.2	20.1
40			
	19.8	20.0	19.9
44			
	19.6	19.8	19.7
48			
	19.4	19.6	19.5
52			
	19.2	19.3	19.2
56			
	18.9	19.1	19.0
60			
	18.7	18.8	18.7
64			
	18.4	18.5	18.5
68			
	18.1	18.3	18.2
72			
	17.9	18.0	17.9
76			
	17.6	17.7	17.6
80			
	17.3	17.4	17.3
84			
	17.0	17.1	17.0
88			
	16.8	16.8	16.8
90			

Add to table, back cover

Moon's Upper Limb
Subtract

Alt.	18	19	20
°	′	′	′
0			
	12.5	12.4	12.4
4			
	12.5	12.4	12.5
8			
	12.6	12.4	12.5
12			
	12.6	12.5	12.5
16			
	12.7	12.6	12.6
20			
	12.8	12.7	12.7
24			
	12.9	12.8	12.9
28			
	13.1	12.9	13.0
32			
	13.2	13.2	13.2
36			
	13.4	13.3	13.3
40			
	13.6	13.5	13.5
44			
	13.8	13.7	13.7
48			
	14.0	13.9	14.0
52			
	14.2	14.2	14.2
56			
	14.5	14.4	14.4
60			
	14.7	14.7	14.7
64			
	15.0	15.0	15.0
68			
	15.3	15.2	15.2
72			
	15.5	15.5	15.5
76			
	15.8	15.8	15.8
80			
	16.1	16.1	16.1
84			
	16.4	16.4	16.4
88			
	16.6	16.7	16.6
90			

Subtract from table, back cover

Full Moon 19

GCT	♈ GHA	VENUS −3.9 GHA	VENUS Dec.	MARS 1.7 GHA	MARS Dec.	JUPITER −1.9 GHA	JUPITER Dec.	SATURN 1.3 GHA	SATURN Dec.	MOON GHA	code	MOON Dec.	code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
0	268 23.0	131 12.3	+18 22.5	188 02.2	+23 39.6	257 38.5	+ 3 15.4	91 08.7	+ 3 43.7	336 08.9	24	−25 55.8	+78
1	283 25.5	146 12.3	21.7	203 02.8	39.7	272 40.7	15.6	106 11.1	43.7	350 30.3	25	25 48.0	+79
2	298 28.0	161 12.4	20.8	218 03.4	39.9	287 42.8	15.7	121 13.5	43.6	4 51.8	26	25 40.1	+82
3	313 30.4	176 12.4	·· 19.9	233 04.0	·· 40.0	302 45.0	·· 15.8	136 15.8	·· 43.6	19 13.4	28	·25 31.9	+83
4	328 32.9	191 12.4	19.1	248 04.6	40.1	317 47.2	15.9	151 18.2	43.5	33 35.2	29	25 23.6	+85
5	343 35.3	206 12.4	18.2	263 05.2	40.3	332 49.3	16.0	166 20.6	43.5	47 57.1	30	25 15.1	+87
6	358 37.8	221 12.5	+18 17.4	278 05.8	+23 40.4	347 51.5	+ 3 16.1	181 23.0	+ 3 43.5	62 19.1	31	−25 06.4	+88
7	13 40.3	236 12.5	16.5	293 06.4	40.5	2 53.6	16.3	196 25.4	43.4	76 41.2	33	24 57.6	+90
8	28 42.7	251 12.5	15.7	308 07.0	40.7	17 55.8	16.4	211 27.7	43.4	91 03.5	34	24 48.6	+92
9	43 45.2	266 12.6	·· 14.8	323 07.6	·· 40.8	32 58.0	·· 16.5	226 30.1	·· 43.3	105 25.9	35	·24 39.4	+94
10	58 47.7	281 12.6	13.9	338 08.2	40.9	48 00.1	16.6	241 32.5	43.3	119 48.4	36	24 30.0	+95
11	73 50.1	296 12.6	13.1	353 08.8	41.1	63 02.3	16.7	256 34.9	43.2	134 11.0	38	24 20.5	+97
12	88 52.6	311 12.7	+18 12.2	8 09.4	+23 41.2	78 04.5	+ 3 16.8	271 37.3	+ 3 43.2	148 33.8	40	−24 10.8	+99
13	103 55.1	326 12.7	11.4	23 10.0	41.3	93 06.6	17.0	286 39.6	43.1	162 56.8	41	24 00.9	+100
14	118 57.5	341 12.7	10.5	38 10.6	41.5	108 08.8	17.1	301 42.0	43.1	177 19.9	42	23 50.9	+102
15	134 00.0	356 12.8	·· 09.6	53 11.2	·· 41.6	123 11.0	·· 17.2	316 44.4	·· 43.0	191 43.1	43	·23 40.7	+103
16	149 02.4	11 12.8	08.8	68 11.8	41.7	138 13.1	17.3	331 46.8	43.0	206 06.4	45	23 30.4	+105
17	164 04.9	26 12.8	07.9	83 12.4	41.9	153 15.3	17.4	346 49.1	42.9	220 29.9	46	23 19.9	+107
18	179 07.4	41 12.9	+18 07.1	98 13.0	+23 42.0	168 17.5	+ 3 17.5	1 51.5	+ 3 42.9	234 53.5	48	−23 09.2	+107
19	194 09.8	56 12.9	06.2	113 13.6	42.1	183 19.6	17.6	16 53.9	42.8	249 17.3	49	22 58.5	+110
20	209 12.3	71 13.0	05.3	128 14.2	42.3	198 21.8	17.8	31 56.3	42.8	263 41.2	51	22 47.5	+111
21	224 14.8	86 13.0	·· 04.5	143 14.8	·· 42.4	213 24.0	·· 17.9	46 58.7	·· 42.8	278 05.3	51	·22 36.4	+112
22	239 17.2	101 13.1	03.6	158 15.4	42.5	228 26.1	18.0	62 01.0	42.7	292 29.4	54	22 25.2	+113
23	254 19.7	116 13.1	02.7	173 16.0	42.7	243 28.3	18.1	77 03.4	42.7	306 53.8	55	22 13.9	+115
0	269 22.2	131 13.1	+18 01.9	188 16.6	+23 42.8	258 30.5	+ 3 18.2	92 05.8	+ 3 42.6	321 18.3	56	−22 02.4	+116
1	284 24.6	146 13.2	01.0	203 17.2	42.9	273 32.6	18.3	107 08.2	42.6	335 42.9	58	21 50.8	+118
2	299 27.1	161 13.2	18 00.1	218 17.8	43.0	288 34.8	18.5	122 10.5	42.5	350 07.7	59	21 39.0	+119
3	314 29.6	176 13.3	·17 59.3	233 18.4	·· 43.2	303 37.0	·· 18.6	137 12.9	·· 42.5	4 32.6	60	·21 27.1	+120
4	329 32.0	191 13.3	58.4	248 19.0	43.3	318 39.1	18.7	152 15.3	42.4	18 57.6	62	21 15.1	+121
5	344 34.5	206 13.4	57.5	263 19.6	43.4	333 41.3	18.8	167 17.7	42.4	33 22.8	64	21 03.0	+123
6	359 36.9	221 13.5	+17 56.7	278 20.2	+23 43.5	348 43.5	+ 3 18.9	182 20.0	+ 3 42.3	47 48.2	64	−20 50.7	+123
7	14 39.4	236 13.5	55.8	293 20.8	43.7	3 45.6	19.0	197 22.4	42.3	62 13.6	67	20 38.4	+125
8	29 41.9	251 13.6	54.9	308 21.4	43.8	18 47.8	19.1	212 24.8	42.2	76 39.3	67	20 25.9	+126
9	44 44.3	266 13.6	·· 54.1	323 22.0	·· 43.9	33 50.0	·· 19.3	227 27.2	·· 42.2	91 05.0	69	·20 13.3	+128
10	59 46.8	281 13.7	53.2	338 22.6	44.0	48 52.1	19.4	242 29.5	42.1	105 30.9	71	20 00.5	+128
11	74 49.3	296 13.7	52.3	353 23.2	44.2	63 54.3	19.5	257 31.9	42.1	119 57.0	72	19 47.7	+129
12	89 51.7	311 13.8	+17 51.5	8 23.9	+23 44.3	78 56.5	+ 3 19.6	272 34.3	+ 3 42.0	134 23.2	73	−19 34.8	+131
13	104 54.2	326 13.9	50.6	23 24.5	44.4	93 58.6	19.7	287 36.7	42.0	148 49.5	75	19 21.7	+131
14	119 56.7	341 13.9	49.7	38 25.1	44.5	109 00.8	19.8	302 39.0	41.9	163 16.0	76	19 08.6	+133
15	134 59.1	356 14.0	·· 48.8	53 25.7	·· 44.7	124 03.0	·· 19.9	317 41.4	·· 41.9	177 42.6	77	·18 55.3	+133
16	150 01.6	11 14.1	48.0	68 26.3	44.8	139 05.2	20.0	332 43.8	41.8	192 09.3	79	18 42.0	+134
17	165 04.1	26 14.1	47.1	83 26.9	44.9	154 07.3	20.2	347 46.2	41.8	206 36.2	81	18 28.6	+136
18	180 06.5	41 14.2	+17 46.2	98 27.5	+23 45.0	169 09.5	+ 3 20.3	2 48.5	+ 3 41.7	221 03.3	81	−18 15.0	+136
19	195 09.0	56 14.3	45.3	113 28.1	45.2	184 11.7	20.4	17 50.9	41.7	235 30.4	83	18 01.4	+137
20	210 11.4	71 14.3	44.5	128 28.7	45.3	199 13.8	20.5	32 53.3	41.7	249 57.7	84	17 47.7	+138
21	225 13.9	86 14.4	·· 43.6	143 29.3	·· 45.4	214 16.0	·· 20.6	47 55.6	·· 41.6	264 25.1	86	·17 33.9	+139
22	240 16.4	101 14.5	42.7	158 29.9	45.5	229 18.2	20.7	62 58.0	41.6	278 52.7	87	17 20.0	+140
23	255 18.8	116 14.6	41.8	173 30.5	45.6	244 20.4	20.8	78 00.4	41.5	293 20.4	88	17 06.0	+140
0	270 21.3	131 14.6	+17 41.0	188 31.1	+23 45.8	259 22.5	+ 3 20.9	93 02.8	+ 3 41.5	307 48.2	90	−16 52.0	+141
1	285 23.8	146 14.7	40.1	203 31.7	45.9	274 24.7	21.1	108 05.1	41.4	322 16.2	91	16 37.9	+143
2	300 26.2	161 14.8	39.2	218 32.3	46.0	289 26.9	21.2	123 07.5	41.4	336 44.3	92	16 23.6	+142
3	315 28.7	176 14.9	·· 38.3	233 32.9	·· 46.1	304 29.1	·· 21.3	138 09.9	·· 41.3	351 12.5	93	·16 09.4	+144
4	330 31.2	191 14.9	37.4	248 33.5	46.2	319 31.2	21.4	153 12.3	41.3	5 40.8	95	15 55.0	+144
5	345 33.6	206 15.0	36.6	263 34.1	46.3	334 33.4	21.5	168 14.6	41.2	20 09.3	96	15 40.6	+145
6	0 36.1	221 15.1	+17 35.7	278 34.7	+23 46.5	349 35.6	+ 3 21.6	183 17.0	+ 3 41.2	34 37.9	97	−15 26.1	+145
7	15 38.6	236 15.2	34.8	293 35.3	46.6	4 37.7	21.7	198 19.4	41.1	49 06.6	99	15 11.6	+147
8	30 41.0	251 15.3	33.9	308 35.9	46.7	19 39.9	21.8	213 21.7	41.1	63 35.5	99	14 56.9	+146
9	45 43.5	266 15.4	·· 33.0	323 36.5	·· 46.8	34 42.1	·· 22.0	228 24.1	·· 41.0	78 04.4	101	·14 42.3	+148
10	60 45.9	281 15.4	32.2	338 37.1	46.9	49 44.3	22.1	243 26.5	41.0	92 33.5	102	14 27.5	+148
11	75 48.4	296 15.5	31.3	353 37.7	47.0	64 46.4	22.2	258 28.9	40.9	107 02.7	104	14 12.7	+148
12	90 50.9	311 15.6	+17 30.4	8 38.3	+23 47.2	79 48.6	+ 3 22.3	273 31.2	+ 3 40.9	121 32.1	104	−13 57.9	+150
13	105 53.3	326 15.7	29.5	23 38.9	47.3	94 50.8	22.4	288 33.6	40.8	136 01.5	106	13 42.9	+149
14	120 55.8	341 15.8	28.6	38 39.5	47.4	109 53.0	22.5	303 36.0	40.8	150 31.1	106	13 28.0	+150
15	135 58.3	356 15.9	·· 27.7	53 40.1	·· 47.5	124 55.1	·· 22.6	318 38.3	·· 40.7	165 00.7	108	·13 13.0	+151
16	151 00.7	11 16.0	26.8	68 40.7	47.6	139 57.3	22.7	333 40.7	40.7	179 30.5	109	12 57.9	+151
17	166 03.2	26 16.1	26.0	83 41.3	47.7	154 59.5	22.8	348 43.1	40.6	194 00.4	110	12 42.8	+152
18	181 05.7	41 16.2	+17 25.1	98 41.9	+23 47.8	170 01.7	+ 3 23.0	3 45.5	+ 3 40.6	208 30.4	111	−12 27.6	+152
19	196 08.1	56 16.3	24.2	113 42.5	48.0	185 03.9	23.1	18 47.8	40.5	223 00.5	112	12 12.4	+152
20	211 10.6	71 16.4	23.3	128 43.1	48.1	200 06.0	23.2	33 50.2	40.5	237 30.7	114	11 57.2	+153
21	226 13.1	86 16.5	·· 22.4	143 43.7	·· 48.2	215 08.2	·· 23.3	48 52.6	·· 40.4	252 01.1	114	·11 41.9	+153
22	241 15.5	101 16.6	21.5	158 44.3	48.3	230 10.4	23.4	63 54.9	40.4	266 31.5	115	11 26.6	+154
23	256 18.0	116 16.7	20.6	173 44.9	48.4	245 12.6	23.5	78 57.3	40.3	281 02.0	116	11 11.2	+154
24	271 20.4	131 16.8	+17 19.7	188 45.5	+23 48.5	260 14.7	+ 3 23.6	93 59.7	+ 3 40.3	295 32.6	118	−10 55.8	+154
code	—	+ 1	− 9	+ 6	+ 1	+ 21	+ 1	+ 24	0				

GCT	SUN GHA	SUN Dec.
h	° ′	° ′
0	179 39.4	+23 26.6
1	194 39.3	26.6
2	209 39.2	26.6
3	224 39.0	·· 26.6
4	239 38.9	26.6
5	254 38.8	26.7
6	269 38.6	+23 26.7
7	284 38.5	26.7
8	299 38.3	26.7
9	314 38.2	·· 26.7
10	329 38.1	26.7
11	344 37.9	26.7
12	359 37.8	+23 26.8
13	14 37.7	26.8
14	29 37.5	26.8
15	44 37.4	·· 26.8
16	59 37.3	26.8
17	74 37.1	26.8
18	89 37.0	+23 26.8
19	104 36.9	26.8
20	119 36.7	26.8
21	134 36.6	·· 26.8
22	149 36.5	26.9
23	164 36.3	26.9
0	179 36.2	+23 26.9
1	194 36.1	26.9
2	209 35.9	26.9
3	224 35.8	·· 26.9
4	239 35.6	26.9
5	254 35.5	26.9
6	269 35.4	+23 26.9
7	284 35.2	26.9
8	299 35.1	26.9
9	314 35.0	·· 26.9
10	329 34.8	26.9
11	344 34.7	26.9
12	359 34.6	+23 26.9
13	14 34.4	26.9
14	29 34.3	26.8
15	44 34.2	·· 26.8
16	59 34.0	26.8
17	74 33.9	26.8
18	89 33.8	+23 26.8
19	104 33.6	26.8
20	119 33.5	26.8
21	134 33.4	·· 26.8
22	149 33.2	26.8
23	164 33.1	26.8
0	179 33.0	+23 26.8
1	194 32.8	26.7
2	209 32.7	26.7
3	224 32.6	·· 26.7
4	239 32.4	26.7
5	254 32.3	26.7
6	269 32.1	+23 26.7
7	284 32.0	26.6
8	299 31.9	26.6
9	314 31.7	·· 26.6
10	329 31.6	26.6
11	344 31.5	26.6
12	359 31.3	+23 26.5
13	14 31.2	26.5
14	29 31.1	26.5
15	44 30.9	·· 26.5
16	59 30.8	26.4
17	74 30.7	26.4
18	89 30.5	+23 26.4
19	104 30.4	26.4
20	119 30.3	26.3
21	134 30.1	·· 26.3
22	149 30.0	26.3
23	164 29.9	26.3
24	179 29.7	+23 26.2
code	—	0

STARS No.	SHA	Dec.	Transit Mer. Gr.
	° ′	° ′	h m
1	358 31.9	+28 49.2	6 07
2	358 21.6	+58 52.7	6 08
3	349 42.6	−18 15.0	6 43
4	339 21.1	+59 58.8	7 24
5	336 01.4	−57 28.6	7 37
6	332 48.8	+89 02.0	7 50
7	328 53.7	+23 14.0	8 06
8	315 53.9	−40 29.6	8 57
9	309 47.7	+49 41.4	9 22
10	291 43.3	+16 24.9	10 34
11	281 57.2	− 8 15.2	11 13
12	281 43.9	+45 57.1	11 14
13	279 22.4	+ 6 18.6	11 23
14	279 12.0	+28 34.2	11 24
15	276 34.0	− 1 13.7	11 34
16	271 52.1	+ 7 24.1	11 53
17	264 17.4	−52 40.0	12 23
18	259 15.2	−16 38.8	12 43
19	255 49.6	−28 54.2	12 57
20	245 48.8	+ 5 21.2	13 37
21	244 25.0	+28 08.9	13 43
22	234 37.9	−59 21.2	14 22
23	223 27.2	−43 14.2	15 06
24	221 50.8	−69 31.2	15 13
25	218 42.1	− 8 26.8	15 25
26	208 33.2	+12 12.4	16 06
27	194 48.6	+62 01.1	17 00
28	183 21.1	+14 50.7	17 46
29	174 01.8	−62 50.2	18 23
30	172 53.2	−56 50.8	18 28
31	168 47.0	−59 25.8	18 44
32	167 01.1	+56 13.6	18 51
33	159 29.9	+55 10.9	19 21
34	159 20.3	−10 54.7	19 22
35	153 35.1	+49 33.4	19 45
36	149 02.5	−36 08.2	20 03
37	146 38.0	+19 26.1	20 13
38	140 55.4	−60 38.6	20 35
39	137 16.5	+74 21.4	20 50
40	126 50.1	+26 52.6	21 32
41	120 37.7	−22 29.3	21 56
42	113 23.2	−26 19.8	22 25
43	109 06.5	−68 56.7	22 42
44	103 05.7	−15 40.2	23 06
45	97 24.8	−37 04.4	23 29
46	96 49.4	+12 35.5	23 31
47	91 07.3	+51 29.5	23 54
48	84 45.2	−34 24.7	0 23
49	81 10.1	+38 44.1	0 38
50	76 55.7	−26 21.6	0 55
51	62 53.4	+ 8 44.2	1 51
52	54 31.9	−56 53.5	2 24
53	50 03.0	+45 06.1	2 42
54	34 32.7	+ 9 39.0	3 44
55	28 41.8	−47 11.6	4 07
56	16 15.1	−29 52.6	4 57
57	14 24.7	+14 56.5	5 04

Lat.	Sunrise	Twlt. begins	Moonrise 21	Moonrise 22	Moonrise 23	Moonrise 24
N °	h m	h m	h m	h m	h m	h m
70	□	□	■	■	1 14	{0 27 / 23 56}
68	□	□	■	2 07	0 44	{0 14 / 23 51}
66	□	□	■	0 58	0 22	{0 02 / 23 47}
64	1 31	////	1 23	0 22	{0 04 / 23 53}	23 43
62	2 09	////	{0 04 / 23 56}	23 50	23 44	23 40
60	2 35	////	23 35	23 37	23 37	23 37
58	2 56	////	23 18	23 26	23 31	23 34
56	3 13	////	23 03	23 17	23 25	23 32
54	3 27	////	22 51	23 08	23 20	23 30
52	3 40	////	22 40	23 01	23 16	23 28
50	3 50	////	22 30	22 54	23 12	23 26
45	4 13	1 40	22 09	22 39	23 02	23 22
40	4 31	2 28	21 52	22 27	22 55	23 19
35	4 46	2 59	21 38	22 16	22 48	23 16
30	4 59	3 22	21 25	22 07	22 42	23 14
20	5 21	3 57	21 03	21 51	22 32	23 09
10	5 40	4 22	20 45	21 37	22 23	23 05
0	5 58	4 43	20 27	21 24	22 15	23 02
10	6 15	5 00	20 09	21 11	22 07	22 58
20	6 34	5 15	19 50	20 56	21 58	22 54
30	6 55	5 29	19 28	20 40	21 47	22 50
35	7 08	5 36	19 16	20 31	21 41	22 48
40	7 21	5 44	19 01	20 20	21 34	22 45
45	7 39	5 51	18 43	20 07	21 26	22 41
50	8 00	5 59	18 20	19 51	21 17	22 37
52	8 09	6 03	18 10	19 43	21 12	22 35
54	8 21	6 06	17 58	19 35	21 07	22 33
56	8 33	6 11	17 44	19 26	21 02	22 31
58	8 48	6 15	17 27	19 15	20 56	22 29
60	9 06	6 19	17 08	19 03	20 48	22 26
S						

Lat.	Sunset	Twlt. ends	Moonset 21	Moonset 22	Moonset 23	Moonset 24
N °	h m	h m	h m	h m	h m	h m
70	□	□	■	■	6 24	8 55
68	□	□	■	3 35	6 52	9 06
66	□	□	■	4 42	7 12	9 15
64	22 32	////	2 09	5 17	7 29	9 23
62	21 54	////	3 26	5 42	7 42	9 30
60	21 28	////	4 02	6 02	7 54	9 35
58	21 07	////	4 28	6 18	8 03	9 40
56	20 50	////	4 48	6 32	8 12	9 45
54	20 36	////	5 05	6 44	8 19	9 49
52	20 24	////	5 19	6 54	8 26	9 52
50	20 13	////	5 32	7 03	8 32	9 56
45	19 50	22 23	5 58	7 23	8 45	10 03
40	19 32	21 35	6 18	7 38	8 56	10 08
35	19 17	21 04	6 35	7 52	9 05	10 13
30	19 04	20 41	6 50	8 03	9 13	10 18
20	18 42	20 06	7 14	8 22	9 26	10 25
10	18 23	19 41	7 35	8 39	9 38	10 32
0	18 05	19 20	7 55	8 55	9 49	10 38
10	17 48	19 03	8 14	9 10	10 00	10 44
20	17 30	18 49	8 35	9 27	10 11	10 50
30	17 08	18 34	8 59	9 45	10 24	10 57
35	16 56	18 27	9 13	9 56	10 31	11 01
40	16 41	18 19	9 29	10 08	10 40	11 06
45	16 25	18 12	9 48	10 23	10 49	11 11
50	16 04	18 04	10 11	10 40	11 01	11 17
52	15 54	18 00	10 22	10 48	11 06	11 20
54	15 43	17 57	10 35	10 58	11 12	11 23
56	15 30	17 52	10 50	11 08	11 19	11 27
58	15 16	17 49	11 07	11 19	11 26	11 30
60	14 58	17 44	11 27	11 33	11 34	11 35
S						

GCT	Equation of Time (App.—Mean) 21	22	23
h	m s	m s	m s
0	− 1 22.0	− 1 35.0	− 1 47.9
6	− 1 25.3	− 1 38.2	− 1 51.1
12	− 1 28.5	− 1 41.4	− 1 54.4
18	− 1 31.7	− 1 44.7	− 1 57.6
24	− 1 35.0	− 1 47.9	− 2 00.8

GCT of Transit Meridian of Greenwich

DAY	Moon	Venus	Mars	Jupiter	Saturn
	h m	h m	h m	h m	h m
21	1 40	15 15	11 27	6 49	17 53
22	2 41	15 15	11 26	6 45	17 49
23	3 36	15 15	11 26	6 42	17 45
24	4 26	15 15	11 25	6 38	17 41

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb	Venus	Mars
°	′	′	′
0			
	0.1	0.2	0.1
30			
	0.1	0.2	0.0
45			
	0.1	0.1	0.0
60			
	0.1	0.1	0.0
75			
	0.1	0.0	0.0
90			

Moon's Lower Limb

Add

Alt.	21	22	23
°	′	′	′
0			
	20.4	19.5	18.3
4			
	20.4	19.5	18.3
8			
	20.3	19.5	18.3
12			
	20.3	19.4	18.3
16			
	20.2	19.3	18.2
20			
	20.1	19.3	18.2
24			
	20.0	19.2	18.1
28			
	19.9	19.1	18.1
32			
	19.7	19.0	18.0
36			
	19.6	18.8	17.9
40			
	19.4	18.7	17.8
44			
	19.2	18.5	17.7
48			
	19.0	18.4	17.6
52			
	18.8	18.2	17.4
56			
	18.6	18.0	17.3
60			
	18.4	17.9	17.2
64			
	18.1	17.7	17.0
68			
	17.9	17.5	16.9
72			
	17.6	17.2	16.8
76			
	17.4	17.0	16.6
80			
	17.1	16.8	16.5
84			
	16.9	16.6	16.3
88			
	16.7	16.4	16.2
90			

Add to table, back cover

Moon's Upper Limb

Subtract

Alt.	21	22	23
°	′	′	′
0			
	12.8	13.3	14.0
4			
	12.8	13.3	14.0
8			
	12.8	13.3	14.0
12			
	12.9	13.4	14.0
16			
	13.0	13.4	14.1
20			
	13.1	13.5	14.1
24			
	13.2	13.6	14.2
28			
	13.3	13.7	14.2
32			
	13.4	13.8	14.3
36			
	13.6	14.0	14.4
40			
	13.8	14.1	14.5
44			
	13.9	14.2	14.6
48			
	14.1	14.4	14.7
52			
	14.3	14.6	14.9
56			
	14.6	14.8	15.0
60			
	14.8	14.9	15.1
64			
	15.0	15.1	15.3
68			
	15.3	15.3	15.4
72			
	15.5	15.5	15.5
76			
	15.8	15.7	15.7
80			
	16.1	16.0	15.8
84			
	16.3	16.2	16.0
88			
	16.5	16.3	16.1
90			

Subtract from table, back cover

G C T	♈ GHA	VENUS −3.9 GHA	VENUS Dec.	MARS 1.7 GHA	MARS Dec.	JUPITER −1.9 GHA	JUPITER Dec.	SATURN 1.3 GHA	SATURN Dec.	MOON GHA	code	MOON Dec.	code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
0	271 20.4	131 16.8	+17 19.7	188 45.5	+23 48.5	260 14.7	+ 3 23.6	93 59.7	+ 3 40.3	295 32.6	118	−10 55.8	+154
1	286 22.9	146 16.9	18.9	203 46.1	48.6	275 16.9	23.7	109 02.0	40.2	310 03.4	118	10 40.4	+154
2	301 25.4	161 17.0	18.0	218 46.7	48.7	290 19.1	23.8	124 04.4	40.2	324 34.2	119	10 25.0	+155
3	316 27.8	176 17.1	17.1	233 47.3	48.8	305 21.3	23.9	139 06.8	40.1	339 05.1	120	10 09.5	+155
4	331 30.3	191 17.2	16.2	248 47.9	49.0	320 23.5	24.1	154 09.1	40.1	353 36.1	122	9 54.0	+156
5	346 32.8	206 17.3	15.3	263 48.5	49.1	335 25.6	24.2	169 11.5	40.0	8 07.3	122	9 38.4	+155
6	1 35.2	221 17.4	+17 14.4	278 49.1	+23 49.2	350 27.8	+ 3 24.3	184 13.9	+ 3 40.0	22 38.5	123	− 9 22.9	+156
7	16 37.7	236 17.5	13.5	293 49.7	49.3	5 30.0	24.4	199 16.2	39.9	37 09.8	123	9 07.3	+156
8	31 40.2	251 17.6	12.6	308 50.3	49.4	20 32.2	24.5	214 18.6	39.9	51 41.1	125	8 51.7	+157
9	46 42.6	266 17.8	11.7	323 50.9	49.5	35 34.4	24.6	229 21.0	39.8	66 12.6	126	8 36.0	+156
10	61 45.1	281 17.9	10.8	338 51.5	49.6	50 36.5	24.7	244 23.3	39.8	80 44.2	126	8 20.4	+157
11	76 47.5	296 18.0	09.9	353 52.1	49.7	65 38.7	24.8	259 25.7	39.7	95 15.8	128	8 04.7	+157
12	91 50.0	311 18.1	+17 09.0	8 52.7	+23 49.8	80 40.9	+ 3 24.9	274 28.1	+ 3 39.7	109 47.6	128	− 7 49.0	+157
13	106 52.5	326 18.2	08.1	23 53.3	49.9	95 43.1	25.0	289 30.5	39.6	124 19.4	129	7 33.3	+157
14	121 54.9	341 18.3	07.3	38 53.9	50.0	110 45.3	25.1	304 32.8	39.5	138 51.3	129	7 17.6	+157
15	136 57.4	356 18.5	06.4	53 54.5	50.1	125 47.4	25.3	319 35.2	39.5	153 23.2	131	7 01.9	+158
16	151 59.9	11 18.6	05.5	68 55.1	50.2	140 49.6	25.4	334 37.6	39.4	167 55.3	131	6 46.1	+157
17	167 02.3	26 18.7	04.6	83 55.8	50.3	155 51.8	25.5	349 39.9	39.4	182 27.4	132	6 30.4	+158
18	182 04.8	41 18.8	+17 03.7	98 56.4	+23 50.5	170 54.0	+ 3 25.6	4 42.3	+ 3 39.3	196 59.6	133	− 6 14.6	+157
19	197 07.3	56 19.0	02.8	113 57.0	50.6	185 56.2	25.7	19 44.7	39.3	211 31.9	133	5 58.9	+158
20	212 09.7	71 19.1	01.9	128 57.6	50.7	200 58.4	25.8	34 47.0	39.2	226 04.2	134	5 43.1	+158
21	227 12.2	86 19.2	01.0	143 58.2	50.8	216 00.5	25.9	49 49.4	39.2	240 36.6	135	5 27.3	+158
22	242 14.7	101 19.3	17 00.1	158 58.8	50.9	231 02.7	26.0	64 51.7	39.1	255 09.1	135	5 11.5	+157
23	257 17.1	116 19.5	16 59.2	173 59.4	51.0	246 04.9	26.1	79 54.1	39.1	269 41.6	136	4 55.8	+158
0	272 19.6	131 19.6	+16 58.3	189 00.0	+23 51.1	261 07.1	+ 3 26.2	94 56.5	+ 3 39.0	284 14.2	137	− 4 40.0	+158
1	287 22.0	146 19.7	57.4	204 00.6	51.2	276 09.3	26.3	109 58.8	39.0	298 46.9	137	4 24.2	+158
2	302 24.5	161 19.9	56.5	219 01.2	51.3	291 11.5	26.4	125 01.2	38.9	313 19.6	138	4 08.4	+157
3	317 27.0	176 20.0	55.6	234 01.8	51.4	306 13.6	26.5	140 03.6	38.9	327 52.4	139	3 52.7	+158
4	332 29.4	191 20.1	54.7	249 02.4	51.5	321 15.8	26.7	155 05.9	38.8	342 25.3	139	3 36.9	+158
5	347 31.9	206 20.3	53.8	264 03.0	51.6	336 18.0	26.8	170 08.3	38.8	356 58.2	140	3 21.1	+157
6	2 34.4	221 20.4	+16 52.9	279 03.6	+23 51.7	351 20.2	+ 3 26.9	185 10.7	+ 3 38.7	11 31.2	140	− 3 05.4	+158
7	17 36.8	236 20.6	52.0	294 04.2	51.8	6 22.4	27.0	200 13.0	38.7	26 04.2	141	2 49.6	+157
8	32 39.3	251 20.7	51.1	309 04.8	51.9	21 24.6	27.1	215 15.4	38.6	40 37.3	141	2 33.9	+157
9	47 41.8	266 20.8	50.1	324 05.4	52.0	36 26.8	27.2	230 17.8	38.6	55 10.4	142	2 18.2	+158
10	62 44.2	281 21.0	49.2	339 06.0	52.1	51 28.9	27.3	245 20.1	38.5	69 43.6	142	2 02.4	+157
11	77 46.7	296 21.1	48.3	354 06.6	52.2	66 31.1	27.4	260 22.5	38.5	84 16.8	143	1 46.7	+157
12	92 49.2	311 21.3	+16 47.4	9 07.2	+23 52.3	81 33.3	+ 3 27.5	275 24.9	+ 3 38.4	98 50.1	143	− 1 31.0	+156
13	107 51.6	326 21.4	46.5	24 07.8	52.4	96 35.5	27.6	290 27.2	38.4	113 23.4	144	1 15.4	+157
14	122 54.1	341 21.6	45.6	39 08.4	52.5	111 37.7	27.7	305 29.6	38.3	127 56.8	144	0 59.7	+156
15	137 56.5	356 21.7	44.7	54 09.0	52.6	126 39.9	27.8	320 31.9	38.2	142 30.2	144	0 44.1	+157
16	152 59.0	11 21.9	43.8	69 09.6	52.6	141 42.1	27.9	335 34.3	38.2	157 03.6	145	0 28.4	+156
17	168 01.5	26 22.0	42.9	84 10.2	52.7	156 44.2	28.0	350 36.7	38.1	171 37.1	146	− 0 12.8	+156
18	183 03.9	41 22.2	+16 42.0	99 10.8	+23 52.8	171 46.4	+ 3 28.1	5 39.0	+ 3 38.1	186 10.7	145	+ 0 02.8	+155
19	198 06.4	56 22.3	41.1	114 11.4	52.9	186 48.6	28.2	20 41.4	38.0	200 44.2	146	0 18.3	+156
20	213 08.9	71 22.5	40.2	129 12.0	53.0	201 50.8	28.3	35 43.8	38.0	215 17.8	147	0 33.9	+155
21	228 11.3	86 22.6	39.3	144 12.6	53.1	216 53.0	28.5	50 46.1	37.9	229 51.5	146	0 49.4	+155
22	243 13.8	101 22.8	38.4	159 13.2	53.2	231 55.2	28.6	65 48.5	37.9	244 25.1	147	1 04.9	+155
23	258 16.3	116 23.0	37.4	174 13.8	53.3	246 57.4	28.7	80 50.8	37.8	258 58.8	148	1 20.4	+155
0	273 18.7	131 23.1	+16 36.5	189 14.5	+23 53.4	261 59.6	+ 3 28.8	95 53.2	+ 3 37.8	273 32.6	147	+ 1 35.9	+154
1	288 21.2	146 23.3	35.6	204 15.1	53.5	277 01.8	28.9	110 55.6	37.7	288 06.3	148	1 51.3	+154
2	303 23.7	161 23.4	34.7	219 15.7	53.6	292 03.9	29.0	125 57.9	37.7	302 40.1	149	2 06.7	+154
3	318 26.1	176 23.6	33.8	234 16.3	53.7	307 06.1	29.1	141 00.3	37.6	317 14.0	148	2 22.1	+153
4	333 28.6	191 23.8	32.9	249 16.9	53.8	322 08.3	29.2	156 02.7	37.6	331 47.8	149	2 37.4	+153
5	348 31.0	206 23.9	32.0	264 17.5	53.9	337 10.5	29.3	171 05.0	37.5	346 21.7	149	2 52.7	+153
6	3 33.5	221 24.1	+16 31.1	279 18.1	+23 54.0	352 12.7	+ 3 29.4	186 07.4	+ 3 37.4	0 55.6	149	+ 3 08.0	+152
7	18 36.0	236 24.3	30.1	294 18.7	54.0	7 14.9	29.5	201 09.7	37.4	15 29.5	149	3 23.2	+153
8	33 38.4	251 24.4	29.2	309 19.3	54.1	22 17.1	29.6	216 12.1	37.3	30 03.4	149	3 38.5	+151
9	48 40.9	266 24.6	28.3	324 19.9	54.2	37 19.3	29.7	231 14.5	37.3	44 37.3	150	3 53.6	+152
10	63 43.4	281 24.8	27.4	339 20.5	54.3	52 21.5	29.8	246 16.8	37.2	59 11.3	150	4 08.8	+151
11	78 45.8	296 24.9	26.5	354 21.1	54.4	67 23.7	29.9	261 19.2	37.2	73 45.3	150	4 23.9	+151
12	93 48.3	311 25.1	+16 25.6	9 21.7	+23 54.5	82 25.9	+ 3 30.0	276 21.5	+ 3 37.1	88 19.3	150	+ 4 39.0	+150
13	108 50.8	326 25.3	24.7	24 22.3	54.6	97 28.0	30.1	291 23.9	37.1	102 53.3	150	4 54.0	+150
14	123 53.2	341 25.5	23.7	39 22.9	54.7	112 30.2	30.2	306 26.3	37.0	117 27.3	151	5 09.0	+150
15	138 55.7	356 25.6	22.8	54 23.5	54.8	127 32.4	30.3	321 28.6	37.0	132 01.4	150	5 24.0	+149
16	153 58.1	11 25.8	21.9	69 24.1	54.8	142 34.6	30.4	336 31.0	36.9	146 35.4	151	5 38.9	+149
17	169 00.6	26 26.0	21.0	84 24.7	54.9	157 36.8	30.5	351 33.3	36.9	161 09.5	150	5 53.8	+148
18	184 03.1	41 26.2	+16 20.1	99 25.3	+23 55.0	172 39.0	+ 3 30.6	6 35.7	+ 3 36.8	175 43.5	151	+ 6 08.6	+148
19	199 05.5	56 26.4	19.2	114 25.9	55.1	187 41.2	30.7	21 38.1	36.7	190 17.6	151	6 23.4	+148
20	214 08.0	71 26.6	18.2	129 26.5	55.2	202 43.4	30.8	36 40.4	36.7	204 51.7	150	6 38.2	+147
21	229 10.5	86 26.7	17.3	144 27.1	55.3	217 45.6	30.9	51 42.8	36.6	219 25.7	151	6 52.9	+147
22	244 12.9	101 26.9	16.4	159 27.7	55.4	232 47.8	31.0	66 45.1	36.6	233 59.8	151	7 07.6	+146
23	259 15.4	116 27.1	15.5	174 28.3	55.4	247 50.0	31.1	81 47.5	36.5	248 33.9	151	7 22.2	+146
24	274 17.9	131 27.3	+16 14.6	189 29.0	+23 55.5	262 52.2	+ 3 31.3	96 49.8	+ 3 36.5	263 08.0	151	+ 7 36.8	+145
code	—	+ 1	− 9	+ 6	+ 1	+ 22	+ 1	+ 23	0				

SUN

GCT h	GHA ° ′	Dec. ° ′
24		
0	179 29.7	+23 26.2
1	194 29.6	26.2
2	209 29.5	26.2
3	224 29.3	•• 26.1
4	239 29.2	26.1
5	254 29.1	26.1
6	269 28.9	+23 26.0
7	284 28.8	26.0
8	299 28.7	26.0
9	314 28.5	•• 25.9
10	329 28.4	25.9
11	344 28.3	25.8
12	359 28.1	+23 25.8
13	14 28.0	25.8
14	29 27.9	25.7
15	44 27.7	•• 25.7
16	59 27.6	25.6
17	74 27.5	25.6
18	89 27.3	+23 25.6
19	104 27.2	25.5
20	119 27.1	25.5
21	134 26.9	•• 25.4
22	149 26.8	25.4
23	164 26.6	25.3
25		
0	179 26.5	+23 25.3
1	194 26.4	25.2
2	209 26.2	25.2
3	224 26.1	•• 25.1
4	239 26.0	25.1
5	254 25.8	25.0
6	269 25.7	+23 25.0
7	284 25.6	24.9
8	299 25.4	24.9
9	314 25.3	•• 24.8
10	329 25.2	24.8
11	344 25.0	24.7
12	359 24.9	+23 24.7
13	14 24.8	24.6
14	29 24.7	24.6
15	44 24.5	•• 24.5
16	59 24.4	24.4
17	74 24.3	24.4
18	89 24.1	+23 24.3
19	104 24.0	24.3
20	119 23.9	24.2
21	134 23.7	•• 24.1
22	149 23.6	24.1
23	164 23.5	24.0
26		
0	179 23.3	+23 23.9
1	194 23.2	23.9
2	209 23.1	23.8
3	224 22.9	•• 23.7
4	239 22.8	23.7
5	254 22.7	23.6
6	269 22.5	+23 23.5
7	284 22.4	23.5
8	299 22.3	23.4
9	314 22.1	•• 23.3
10	329 22.0	23.3
11	344 21.9	23.2
12	359 21.7	+23 23.1
13	14 21.6	23.0
14	29 21.5	23.0
15	44 21.3	•• 22.9
16	59 21.2	22.8
17	74 21.1	22.7
18	89 20.9	+23 22.7
19	104 20.8	22.6
20	119 20.7	22.5
21	134 20.5	•• 22.4
22	149 20.4	22.3
23	164 20.3	22.3
24	179 20.1	+23 22.2
code	—	− 1

STARS

No.	SHA ° ′	Dec. ° ′	Transit Mer. Gr. h m
1	358 31.9	+28 49.2	5 56
2	358 21.5	+58 52.7	5 56
3	349 42.6	−18 15.0	6 31
4	339 21.0	+59 58.8	7 12
5	336 01.3	−57 28.6	7 25
6	332 47.8	+89 01.9	7 38
7	328 53.7	+23 14.0	7 54
8	315 53.8	−40 29.6	8 46
9	309 47.7	+49 41.4	9 10
10	291 43.3	+16 24.9	10 22
11	281 57.2	− 8 15.2	11 01
12	281 43.9	+45 57.1	11 02
13	279 22.4	+ 6 18.6	11 11
14	279 12.0	+28 34.2	11 12
15	276 34.0	− 1 13.7	11 23
16	271 52.1	+ 7 24.1	11 41
17	264 17.4	−52 40.0	12 12
18	259 15.2	−16 38.7	12 32
19	255 49.6	−28 54.2	12 45
20	245 48.8	+ 5 21.2	13 25
21	244 25.0	+28 08.9	13 31
22	234 37.9	−59 21.2	14 10
23	223 27.2	−43 14.2	14 54
24	221 50.8	−69 31.2	15 01
25	218 42.1	− 8 26.8	15 13
26	208 33.2	+12 12.4	15 54
27	194 48.6	+62 01.1	16 49
28	183 21.1	+14 50.7	17 34
29	174 01.8	−62 50.2	18 12
30	172 53.2	−56 50.8	18 16
31	168 47.0	−59 25.8	18 33
32	167 01.1	+56 13.6	18 40
33	159 30.0	+55 10.9	19 10
34	159 20.3	−10 54.6	19 10
35	153 35.1	+49 33.4	19 33
36	149 02.5	−36 08.2	19 51
37	146 38.0	+19 26.1	20 01
38	140 55.4	−60 38.6	20 24
39	137 16.5	+74 21.4	20 38
40	126 50.1	+26 52.6	21 20
41	120 37.7	−22 29.3	21 45
42	113 23.2	−26 19.8	22 13
43	109 06.5	−68 56.8	22 31
44	103 05.7	−15 40.2	22 55
45	97 24.8	−37 04.4	23 17
46	96 49.4	+12 35.5	23 20
47	91 07.3	+51 29.5	23 42
48	84 45.2	−34 24.7	0 12
49	81 10.1	+38 44.1	0 26
50	76 55.7	−26 21.6	0 43
51	62 53.4	+ 8 44.2	1 39
52	54 31.9	−56 53.5	2 12
53	50 03.0	+45 06.2	2 30
54	34 32.7	+ 9 39.0	3 32
55	28 41.7	−47 11.6	3 55
56	16 15.1	−29 52.6	4 45
57	14 24.7	+14 56.6	4 52

Sunrise, Twilight and Moonrise

Lat. °	Sunrise h m	Twlt. begins h m	Moonrise 24 h m	25 h m	26 h m	27 h m
N 70	□	□	{0 27 / 23 56}	23 30	23 04	22 33
68	□	□	{0 14 / 23 51}	23 32	23 12	22 50
66	□	□	{0 02 / 23 47}	23 33	23 19	23 04
64	1 32	////	23 43	23 34	23 25	23 16
62	2 10	////	23 40	23 35	23 30	23 26
60	2 37	////	23 37	23 36	23 35	23 34
58	2 57	////	23 34	23 37	23 39	23 42
56	3 14	////	23 32	23 37	23 43	23 49
54	3 28	////	23 30	23 38	23 46	23 55
52	3 41	////	23 28	23 38	23 49	24 00
50	3 51	////	23 26	23 39	23 51	24 05
45	4 14	1 41	23 22	23 40	23 57	24 16
40	4 32	2 29	23 19	23 41	24 02	0 02
35	4 47	3 00	23 16	23 42	24 07	0 07
30	5 00	3 23	23 14	23 42	24 11	0 11
20	5 22	3 58	23 09	23 44	24 17	0 17
10	5 41	4 23	23 05	23 45	24 23	0 23
0	5 59	4 44	23 02	23 46	24 29	0 29
10	6 16	5 01	22 58	23 47	24 34	0 34
20	6 35	5 16	22 54	23 48	24 41	0 41
30	6 56	5 30	22 50	23 50	24 48	0 48
35	7 08	5 37	22 48	23 51	24 52	0 52
40	7 23	5 44	22 45	23 51	24 56	0 56
45	7 39	5 52	22 41	23 53	25 02	1 02
50	8 00	6 00	22 37	23 54	25 08	1 08
52	8 10	6 04	22 35	23 55	25 11	1 11
54	8 21	6 07	22 33	23 55	25 15	1 15
56	8 34	6 12	22 31	23 56	25 18	1 18
58	8 48	6 15	22 29	23 57	25 22	1 22
60	9 06	6 20	22 26	23 58	25 27	1 27
S						

Sunset, Twilight and Moonset

Lat. °	Sunset h m	Twlt. ends h m	Moonset 24 h m	25 h m	26 h m	27 h m
N 70	□	□	8 55	11 02	13 02	15 03
68	□	□	9 06	11 04	12 56	14 48
66	□	□	9 15	11 06	12 51	14 36
64	22 32	////	9 23	11 08	12 47	14 26
62	21 54	////	9 30	11 09	12 44	14 17
60	21 28	////	9 35	11 10	12 41	14 09
58	21 07	////	9 40	11 11	12 38	14 03
56	20 51	////	9 45	11 12	12 35	13 57
54	20 36	////	9 49	11 13	12 33	13 52
52	20 24	////	9 52	11 14	12 31	13 48
50	20 13	////	9 56	11 14	12 30	13 43
45	19 51	22 24	10 03	11 16	12 26	13 34
40	19 33	21 36	10 08	11 17	12 23	13 27
35	19 18	21 05	10 13	11 18	12 20	13 21
30	19 05	20 42	10 18	11 19	12 18	13 15
20	18 43	20 07	10 25	11 20	12 13	13 05
10	18 24	19 42	10 32	11 22	12 10	12 57
0	18 06	19 21	10 38	11 23	12 06	12 49
10	17 49	19 04	10 44	11 24	12 03	12 41
20	17 30	18 49	10 50	11 25	11 59	12 33
30	17 09	18 35	10 57	11 27	11 55	12 24
35	16 57	18 28	11 01	11 28	11 53	12 18
40	16 42	18 20	11 06	11 29	11 50	12 12
45	16 26	18 13	11 11	11 30	11 47	12 05
50	16 05	18 05	11 17	11 31	11 44	11 57
52	15 55	18 01	11 20	11 31	11 42	11 53
54	15 44	17 58	11 23	11 32	11 40	11 49
56	15 31	17 53	11 27	11 33	11 38	11 44
58	15 17	17 50	11 30	11 33	11 36	11 39
60	14 59	17 45	11 35	11 34	11 33	11 33
S						

Equation of Time (App.—Mean)

GCT h	24 m s	25 m s	26 m s
0	− 2 00.8	− 2 13.7	− 2 26.5
6	− 2 04.0	− 2 16.9	− 2 29.6
12	− 2 07.3	− 2 20.1	− 2 32.8
18	− 2 10.5	− 2 23.3	− 2 36.0
24	− 2 13.7	− 2 26.5	− 2 39.1

GCT of Transit Meridian of Greenwich

DAY	Moon h m	Venus h m	Mars h m	Jupiter h m	Saturn h m
24	4 26	15 15	11 25	6 38	17 41
25	5 13	15 15	11 24	6 35	17 38
26	5 56	15 14	11 23	6 31	17 34
27	6 39	15 14	11 22	6 28	17 30

ADDITIONAL ALTITUDE CORRECTIONS

Alt. °	Sun's Low'r Limb ′	Venus ′	Mars ′
0			
30	0.1	0.2	0.1
45	0.1	0.2	0.0
60	0.1	0.1	0.0
75	0.1	0.1	0.0
90	0.1	0.0	0.0

Moon's Lower Limb

Add

Alt. °	24 ′	25 ′	26 ′
0			
4	17.2	16.1	14.9
8	17.2	16.1	14.9
12	17.2	16.1	14.9
16	17.2	16.0	14.9
20	17.1	16.0	14.9
24	17.1	16.0	15.0
28	17.1	16.0	15.0
32	17.0	16.0	15.0
36	17.0	16.0	15.0
40	16.9	16.0	15.0
44	16.9	16.0	15.0
48	16.8	15.9	15.1
52	16.7	15.9	15.1
56	16.7	15.9	15.1
60	16.6	15.9	15.1
64	16.5	15.8	15.2
68	16.4	15.8	15.2
72	16.4	15.8	15.2
76	16.3	15.8	15.3
80	16.2	15.7	15.3
84	16.1	15.7	15.3
88	16.0	15.7	15.4
90	15.9	15.7	15.4

Add to table, back cover

Moon's Upper Limb

Subtract

Alt. °	24 ′	25 ′	26 ′
0			
4	14.6	15.3	15.9
8	14.6	15.3	15.9
12	14.6	15.3	15.9
16	14.6	15.3	15.9
20	14.7	15.3	15.9
24	14.7	15.3	15.9
28	14.7	15.3	15.9
32	14.8	15.3	15.8
36	14.8	15.3	15.8
40	14.9	15.3	15.8
44	14.9	15.4	15.8
48	15.0	15.4	15.8
52	15.1	15.4	15.7
56	15.1	15.4	15.7
60	15.2	15.4	15.7
64	15.3	15.5	15.6
68	15.4	15.5	15.6
72	15.5	15.5	15.6
76	15.5	15.5	15.6
80	15.6	15.6	15.5
84	15.7	15.6	15.5
88	15.8	15.6	15.4
90	15.9	15.7	15.4

Subtract from table, back cover

Last Quarter 26

GCT	♈ GHA	VENUS −4.0 GHA	VENUS Dec.	MARS 1.8 GHA	MARS Dec.	JUPITER −2.0 GHA	JUPITER Dec.	SATURN 1.3 GHA	SATURN Dec.	MOON GHA	code	MOON Dec.	code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
0	274 17.9	131 27.3	+16 14.6	189 29.0	+23 55.5	262 52.2	+ 3 31.3	96 49.8	+ 3 36.5	263 08.0	151	+ 7 36.8	+145
1	289 20.3	146 27.5	13.6	204 29.6	55.6	277 54.4	31.4	111 52.2	36.4	277 42.1	150	7 51.3	+145
2	304 22.8	161 27.7	12.7	219 30.2	55.7	292 56.6	31.5	126 54.6	36.4	292 16.1	151	8 05.8	+145
3	319 25.3	176 27.9	·· 11.8	234 30.8	·· 55.8	307 58.8	·· 31.6	141 56.9	·· 36.3	306 50.2	151	· 8 20.3	+143
4	334 27.7	191 28.1	10.9	249 31.4	55.9	323 01.0	31.7	156 59.3	36.2	321 24.3	150	8 34.6	+144
5	349 30.2	206 28.3	10.0	264 32.0	55.9	338 03.2	31.8	172 01.6	36.2	335 58.3	151	8 49.0	+143
6	4 32.6	221 28.5	+16 09.0	279 32.6	+23 56.0	353 05.4	+ 3 31.9	187 04.0	+ 3 36.1	350 32.4	150	+ 9 03.3	+142
7	19 35.1	236 28.7	08.1	294 33.2	56.1	8 07.6	32.0	202 06.4	36.1	5 06.4	151	9 17.5	+142
8	34 37.6	251 28.9	07.2	309 33.8	56.2	23 09.8	32.1	217 08.7	36.0	19 40.5	150	9 31.7	+141
9	49 40.0	266 29.1	·· 06.3	324 34.4	·· 56.3	38 11.9	·· 32.2	232 11.1	·· 36.0	34 14.5	150	· 9 45.8	+141
10	64 42.5	281 29.3	05.3	339 35.0	56.3	53 14.1	32.3	247 13.4	35.9	48 48.5	150	9 59.9	+140
11	79 45.0	296 29.5	04.4	354 35.6	56.4	68 16.3	32.4	262 15.8	35.9	63 22.5	150	10 13.9	+140
12	94 47.4	311 29.7	+16 03.5	9 36.2	+23 56.5	83 18.5	+ 3 32.5	277 18.1	+ 3 35.8	77 56.5	150	+10 27.9	+139
13	109 49.9	326 29.9	02.6	24 36.8	56.6	98 20.7	32.6	292 20.5	35.7	92 30.5	150	10 41.8	+139
14	124 52.4	341 30.1	01.6	39 37.4	56.7	113 22.9	32.7	307 22.9	35.7	107 04.5	149	10 55.7	+138
15	139 54.8	356 30.3	·16 00.7	54 38.0	·· 56.7	128 25.1	·· 32.8	322 25.2	·· 35.6	121 38.4	149	·11 09.5	+137
16	154 57.3	11 30.5	15 59.8	69 38.6	56.8	143 27.3	32.9	337 27.6	35.6	136 12.3	149	11 23.2	+137
17	169 59.8	26 30.7	58.9	84 39.2	56.9	158 29.5	33.0	352 29.9	35.5	150 46.2	149	11 36.9	+136
18	185 02.2	41 30.9	+15 57.9	99 39.8	+23 57.0	173 31.7	+ 3 33.1	7 32.3	+ 3 35.5	165 20.1	149	+11 50.5	+136
19	200 04.7	56 31.1	57.0	114 40.5	57.1	188 33.9	33.2	22 34.6	35.4	179 54.0	148	12 04.1	+135
20	215 07.1	71 31.3	56.1	129 41.1	57.1	203 36.1	33.3	37 37.0	35.4	194 27.8	149	12 17.6	+134
21	230 09.6	86 31.5	·· 55.1	144 41.7	·· 57.2	218 38.3	·· 33.4	52 39.3	·· 35.3	209 01.7	147	·12 31.0	+134
22	245 12.1	101 31.8	54.2	159 42.3	57.3	233 40.5	33.5	67 41.7	35.2	223 35.4	148	12 44.4	+133
23	260 14.5	116 32.0	53.3	174 42.9	57.4	248 42.7	33.6	82 44.1	35.2	238 09.2	148	12 57.7	+132
0	275 17.0	131 32.2	+15 52.4	189 43.5	+23 57.4	263 44.9	+ 3 33.7	97 46.4	+ 3 35.1	252 43.0	147	+13 10.9	+132
1	290 19.5	146 32.4	51.4	204 44.1	57.5	278 47.1	33.8	112 48.8	35.1	267 16.7	147	13 24.1	+131
2	305 21.9	161 32.6	50.5	219 44.7	57.6	293 49.3	33.9	127 51.1	35.0	281 50.4	147	13 37.2	+131
3	320 24.4	176 32.9	·· 49.6	234 45.3	·· 57.7	308 51.5	·· 34.0	142 53.5	·· 35.0	296 24.1	146	·13 50.3	+130
4	335 26.9	191 33.1	48.6	249 45.9	57.7	323 53.7	34.1	157 55.8	34.9	310 57.7	146	14 03.3	+129
5	350 29.3	206 33.3	47.7	264 46.5	57.8	338 55.9	34.2	172 58.2	34.8	325 31.3	146	14 16.2	+128
6	5 31.8	221 33.5	+15 46.8	279 47.1	+23 57.9	353 58.1	+ 3 34.3	188 00.5	+ 3 34.8	340 04.9	145	+14 29.0	+128
7	20 34.2	236 33.7	45.8	294 47.7	57.9	9 00.4	34.4	203 02.9	34.7	354 38.4	145	14 41.8	+127
8	35 36.7	251 34.0	44.9	309 48.3	58.0	24 02.6	34.5	218 05.2	34.7	9 11.9	145	14 54.5	+126
9	50 39.2	266 34.2	·· 44.0	324 48.9	·· 58.1	39 04.8	·· 34.6	233 07.6	·· 34.6	23 45.4	144	·15 07.1	+126
10	65 41.6	281 34.4	43.0	339 49.5	58.2	54 07.0	34.7	248 09.9	34.6	38 18.8	145	15 19.7	+125
11	80 44.1	296 34.7	42.1	354 50.1	58.2	69 09.2	34.8	263 12.3	34.5	52 52.3	143	15 32.2	+124
12	95 46.6	311 34.9	+15 41.2	9 50.8	+23 58.3	84 11.4	+ 3 34.9	278 14.7	+ 3 34.5	67 25.6	144	+15 44.6	+123
13	110 49.0	326 35.1	40.2	24 51.4	58.4	99 13.6	35.0	293 17.0	34.4	81 59.0	143	15 56.9	+123
14	125 51.5	341 35.4	39.3	39 52.0	58.4	114 15.8	35.1	308 19.4	34.3	96 32.3	142	16 09.2	+122
15	140 54.0	356 35.6	·· 38.4	54 52.6	·· 58.5	129 18.0	·· 35.2	323 21.7	·· 34.3	111 05.5	142	·16 21.4	+121
16	155 56.4	11 35.8	37.4	69 53.2	58.6	144 20.2	35.2	338 24.1	34.2	125 38.7	142	16 33.5	+120
17	170 58.9	26 36.1	36.5	84 53.8	58.7	159 22.4	35.3	353 26.4	34.2	140 11.9	142	16 45.5	+120
18	186 01.4	41 36.3	+15 35.6	99 54.4	+23 58.7	174 24.6	+ 3 35.4	8 28.8	+ 3 34.1	154 45.1	141	+16 57.5	+119
19	201 03.8	56 36.6	34.6	114 55.0	58.8	189 26.8	35.5	23 31.1	34.0	169 18.2	140	17 09.4	+118
20	216 06.3	71 36.8	33.7	129 55.6	58.9	204 29.0	35.6	38 33.5	34.0	183 51.2	140	17 21.2	+117
21	231 08.7	86 37.0	·· 32.7	144 56.2	·· 58.9	219 31.2	·· 35.7	53 35.8	·· 33.9	198 24.2	140	·17 32.9	+116
22	246 11.2	101 37.3	31.8	159 56.8	59.0	234 33.4	35.8	68 38.2	33.9	212 57.2	139	17 44.5	+116
23	261 13.7	116 37.5	30.9	174 57.4	59.1	249 35.6	35.9	83 40.5	33.8	227 30.1	139	17 56.1	+115
0	276 16.1	131 37.8	+15 29.9	189 58.0	+23 59.1	264 37.8	+ 3 36.0	98 42.9	+ 3 33.8	242 03.0	139	+18 07.6	+114
1	291 18.6	146 38.0	29.0	204 58.6	59.2	279 40.0	36.1	113 45.2	33.7	256 35.9	137	18 19.0	+113
2	306 21.1	161 38.3	28.1	219 59.2	59.3	294 42.2	36.2	128 47.6	33.6	271 08.6	138	18 30.3	+112
3	321 23.5	176 38.5	·· 27.1	234 59.9	·· 59.3	309 44.5	·· 36.3	143 49.9	·· 33.6	285 41.4	137	·18 41.5	+112
4	336 26.0	191 38.8	26.2	250 00.5	59.4	324 46.7	36.4	158 52.3	33.5	300 14.1	136	18 52.7	+110
5	351 28.5	206 39.0	25.2	265 01.1	59.5	339 48.9	36.5	173 54.6	33.5	314 46.7	137	19 03.7	+110
6	6 30.9	221 39.3	+15 24.3	280 01.7	+23 59.5	354 51.1	+ 3 36.6	188 57.0	+ 3 33.4	329 19.4	135	+19 14.7	+109
7	21 33.4	236 39.6	23.3	295 02.3	59.6	9 53.3	36.7	203 59.3	33.4	343 51.9	135	19 25.6	+107
8	36 35.9	251 39.8	22.4	310 02.9	59.6	24 55.5	36.8	219 01.7	33.3	358 24.4	135	19 36.3	+107
9	51 38.3	266 40.1	·· 21.5	325 03.5	·· 59.7	39 57.7	·· 36.9	234 04.0	·· 33.2	12 56.9	134	·19 47.0	+107
10	66 40.8	281 40.3	20.5	340 04.1	59.8	54 59.9	37.0	249 06.4	33.2	27 29.3	133	19 57.7	+105
11	81 43.2	296 40.6	19.6	355 04.7	59.8	70 02.1	37.1	264 08.7	33.1	42 01.6	134	20 08.2	+104
12	96 45.7	311 40.9	+15 18.6	10 05.3	+23 59.9	85 04.3	+ 3 37.2	279 11.1	+ 3 33.1	56 34.0	132	+20 18.6	+103
13	111 48.2	326 41.1	17.7	25 05.9	24 00.0	100 06.5	37.3	294 13.4	33.0	71 06.2	132	20 28.9	+103
14	126 50.6	341 41.4	16.8	40 06.5	00.0	115 08.8	37.4	309 15.8	32.9	85 38.4	132	20 39.2	+101
15	141 53.1	356 41.6	·· 15.8	55 07.1	·· 00.1	130 11.0	·· 37.5	324 18.1	·· 32.9	100 10.6	131	·20 49.3	+101
16	156 55.6	11 41.9	14.9	70 07.8	00.1	145 13.2	37.6	339 20.5	32.8	114 42.7	130	20 59.4	+100
17	171 58.0	26 42.2	13.9	85 08.4	00.2	160 15.4	37.7	354 22.8	32.8	129 14.7	130	21 09.4	+ 98
18	187 00.5	41 42.5	+15 13.0	100 09.0	+24 00.3	175 17.6	+ 3 37.8	9 25.2	+ 3 32.7	143 46.7	130	+21 19.2	+ 98
19	202 03.0	56 42.7	12.0	115 09.6	00.3	190 19.8	37.9	24 27.5	32.6	158 18.7	129	21 29.0	+ 97
20	217 05.4	71 43.0	11.1	130 10.2	00.4	205 22.0	37.9	39 29.9	32.6	172 50.6	128	21 38.7	+ 95
21	232 07.9	86 43.3	·· 10.1	145 10.8	·· 00.4	220 24.2	·· 38.0	54 32.2	·· 32.5	187 22.4	128	·21 48.2	+ 95
22	247 10.3	101 43.5	09.2	160 11.4	00.5	235 26.4	38.1	69 34.6	32.5	201 54.2	127	21 57.7	+ 94
23	262 12.8	116 43.8	08.3	175 12.0	00.5	250 28.7	38.2	84 36.9	32.4	216 25.9	127	22 07.1	+ 92
24	277 15.3	131 44.1	+15 07.3	190 12.6	+24 00.6	265 30.9	+ 3 38.3	99 39.3	+ 3 32.4	230 57.6	127	+22 16.3	+ 92
code	–	+ 2	– 10	+ 6	+ 1	+ 22	+ 1	+ 23	– 1				

GCT h	SUN GHA ° ′	Dec. ° ′
0	179 20.1	+23 22.2
1	194 20.0	22.1
2	209 19.9	22.0
3	224 19.8 ··	21.9
4	239 19.6	21.8
5	254 19.5	21.8
6	269 19.4	+23 21.7
7	284 19.2	21.6
8	299 19.1	21.5
9	314 19.0 ··	21.4
10	329 18.8	21.3
11	344 18.7	21.2
12	359 18.6	+23 21.1
13	14 18.4	21.1
14	29 18.3	21.0
15	44 18.2 ··	20.9
16	59 18.1	20.8
17	74 17.9	20.7
18	89 17.8	+23 20.6
19	104 17.7	20.5
20	119 17.5	20.4
21	134 17.4 ··	20.3
22	149 17.3	20.2
23	164 17.1	20.1
0	179 17.0	+23 20.0
1	194 16.9	19.9
2	209 16.7	19.8
3	224 16.6 ··	19.7
4	239 16.5	19.6
5	254 16.4	19.5
6	269 16.2	+23 19.4
7	284 16.1	19.3
8	299 16.0	19.2
9	314 15.8 ··	19.1
10	329 15.7	19.0
11	344 15.6	18.9
12	359 15.5	+23 18.8
13	14 15.3	18.7
14	29 15.2	18.6
15	44 15.1 ··	18.4
16	59 14.9	18.3
17	74 14.8	18.2
18	89 14.7	+23 18.1
19	104 14.5	18.0
20	119 14.4	17.9
21	134 14.3 ··	17.8
22	149 14.2	17.7
23	164 14.0	17.5
0	179 13.9	+23 17.4
1	194 13.8	17.3
2	209 13.6	17.2
3	224 13.5 ··	17.1
4	239 13.4	17.0
5	254 13.3	16.8
6	269 13.1	+23 16.7
7	284 13.0	16.6
8	299 12.9	16.5
9	314 12.8 ··	16.4
10	329 12.6	16.2
11	344 12.5	16.1
12	359 12.4	+23 16.0
13	14 12.2	15.9
14	29 12.1	15.7
15	44 12.0 ··	15.6
16	59 11.9	15.5
17	74 11.7	15.3
18	89 11.6	+23 15.2
19	104 11.5	15.1
20	119 11.4	15.0
21	134 11.2 ··	14.8
22	149 11.1	14.7
23	164 11.0	14.6
24	179 10.8	+23 14.4
code	—	− 1

STARS No.	SHA ° ′	Dec. ° ′	Transit Mer. Gr. h m
1	358 31.9	+28 49.2	5 44
2	358 21.5	+58 52.7	5 44
3	349 42.6	−18 15.0	6 19
4	339 21.0	+59 58.8	7 00
5	336 01.3	−57 28.6	7 14
6	332 46.9	+89 01.9	7 27
7	328 53.6	+23 14.0	7 42
8	315 53.8	−40 29.6	8 34
9	309 47.7	+49 41.4	8 58
10	291 43.2	+16 24.9	10 10
11	281 57.2	− 8 15.2	10 49
12	281 43.9	+45 57.1	10 50
13	279 22.3	+ 6 18.6	11 00
14	279 12.0	+28 34.2	11 00
15	276 34.0	− 1 13.7	11 11
16	271 52.1	+ 7 24.1	11 30
17	264 17.4	−52 40.0	12 00
18	259 15.1	−16 38.7	12 20
19	255 49.6	−28 54.2	12 34
20	245 48.8	+ 5 21.2	13 13
21	244 25.0	+28 08.9	13 19
22	234 37.9	−59 21.2	13 58
23	223 27.3	−43 14.2	14 43
24	221 50.8	−69 31.2	14 49
25	218 42.1	− 8 26.8	15 02
26	208 33.2	+12 12.4	15 42
27	194 48.7	+62 01.1	16 37
28	183 21.2	+14 50.7	17 23
29	174 01.9	−62 50.2	18 00
30	172 53.2	−56 50.8	18 04
31	168 47.0	−59 25.8	18 21
32	167 01.2	+56 13.6	18 28
33	159 30.0	+55 10.9	18 58
34	159 20.4	−10 54.6	18 58
35	153 35.2	+49 33.5	19 21
36	149 02.5	−36 08.2	19 39
37	146 38.0	+19 26.1	19 49
38	140 55.4	−60 38.6	20 12
39	137 16.5	+74 21.4	20 26
40	126 50.1	+26 52.6	21 08
41	120 37.7	−22 29.3	21 33
42	113 23.2	−26 19.8	22 02
43	109 06.5	−68 56.8	22 19
44	103 05.7	−15 40.1	22 43
45	97 24.8	−37 04.4	23 05
46	96 49.4	+12 35.5	23 08
47	91 07.3	+51 29.5	23 31
48	84 45.2	−34 24.7	23 56
49	81 10.1	+38 44.1	0 14
50	76 55.6	−26 21.6	0 31
51	62 53.4	+ 8 44.2	1 27
52	54 31.9	−56 53.5	2 00
53	50 03.0	+45 06.2	2 18
54	34 32.7	+ 9 39.0	3 20
55	28 41.7	−47 11.6	3 43
56	16 15.1	−29 52.6	4 33
57	14 24.7	+14 56.6	4 40

Lat.	Sunrise	Twlt. begins	Moonrise 27	28	29	30
N °	h m	h m	h m	h m	h m	h m
70	▭	▭	22 33	21 45	▭	▭
68	▭	▭	22 50	22 20	21 08	▭
66	▭	▭	23 04	22 45	22 15	▭
64	1 35	////	23 16	23 05	22 50	22 21
62	2 12	////	23 26	23 21	23 16	23 11
60	2 39	////	23 34	23 35	23 36	23 42
58	2 59	////	23 42	23 46	23 53	24 06
56	3 15	////	23 49	23 56	24 08	0 08
54	3 30	////	23 55	24 06	0 06	0 20
52	3 42	////	24 00	0 00	0 14	0 31
50	3 53	////	24 05	0 05	0 21	0 41
45	4 15	1 42	24 16	0 16	0 37	1 01
40	4 33	2 30	0 02	0 25	0 50	1 18
35	4 48	3 01	0 07	0 33	1 01	1 32
30	5 01	3 25	0 11	0 39	1 10	1 45
20	5 23	3 59	0 17	0 51	1 27	2 06
10	5 42	4 24	0 23	1 02	1 42	2 24
0	5 59	4 44	0 29	1 12	1 56	2 42
10	6 17	5 02	0 34	1 22	2 10	2 59
20	6 35	5 16	0 41	1 32	2 25	3 18
30	6 56	5 31	0 48	1 45	2 42	3 40
35	7 09	5 38	0 52	1 52	2 52	3 53
40	7 23	5 44	0 56	2 00	3 04	4 08
45	7 39	5 53	1 02	2 10	3 18	4 25
50	8 00	6 01	1 08	2 22	3 35	4 48
52	8 10	6 04	1 11	2 27	3 43	4 58
54	8 21	6 08	1 15	2 33	3 52	5 10
56	8 34	6 12	1 18	2 40	4 02	5 24
58	8 48	6 15	1 22	2 48	4 13	5 40
60	9 06	6 20	1 27	2 56	4 27	6 00
S						

Lat.	Sunset	Twlt. ends	Moonset 27	28	29	30
N °	h m	h m	h m	h m	h m	h m
70	▭	▭	15 03	17 23	▭	▭
68	▭	▭	14 48	16 49	19 36	▭
66	▭	▭	14 36	16 25	18 31	▭
64	22 30	////	14 26	16 07	17 56	20 04
62	21 53	////	14 17	15 52	17 31	19 15
60	21 27	////	14 09	15 39	17 11	18 44
58	21 07	////	14 03	15 28	16 55	18 21
56	20 50	////	13 57	15 19	16 41	18 02
54	20 36	////	13 52	15 11	16 29	17 47
52	20 24	////	13 48	15 03	16 19	17 33
50	20 13	////	13 43	14 57	16 10	17 22
45	19 51	22 23	13 34	14 42	15 50	16 57
40	19 33	21 36	13 27	14 31	15 35	16 38
35	19 18	21 05	13 21	14 21	15 21	16 22
30	19 05	20 41	13 15	14 12	15 10	16 08
20	18 43	20 07	13 05	13 57	14 50	15 44
10	18 24	19 42	12 57	13 45	14 33	15 24
0	18 07	19 22	12 49	13 33	14 18	15 05
10	17 50	19 05	12 41	13 21	14 02	14 46
20	17 31	18 50	12 33	13 08	13 45	14 26
30	17 10	18 35	12 24	12 53	13 26	14 02
35	16 58	18 29	12 18	12 45	13 15	13 49
40	16 43	18 21	12 12	12 36	13 02	13 33
45	16 27	18 14	12 05	12 25	12 47	13 14
50	16 06	18 05	11 57	12 11	12 29	12 51
52	15 56	18 02	11 53	12 05	12 20	12 40
54	15 45	17 58	11 49	11 58	12 11	12 28
56	15 33	17 55	11 44	11 51	12 00	12 13
58	15 18	17 51	11 39	11 42	11 47	11 56
60	15 01	17 47	11 33	11 32	11 33	11 36
S						

Equation of Time (App.—Mean)

GCT h	27 m s	28 m s	29 m s
0	− 2 39.1	− 2 51.7	− 3 04.1
6	− 2 42.3	− 2 54.8	− 3 07.2
12	− 2 45.4	− 2 57.9	− 3 10.3
18	− 2 48.6	− 3 01.0	− 3 13.3
24	− 2 51.7	− 3 04.1	− 3 16.4

GCT of Transit Meridian of Greenwich

DAY	Moon h m	Venus h m	Mars h m	Jupiter h m	Saturn h m
27	6 39	15 14	11 22	6 28	17 30
28	7 22	15 14	11 21	6 24	17 26
29	8 07	15 13	11 20	6 21	17 22
30	8 53	15 13	11 19	6 17	17 19

ADDITIONAL ALTITUDE CORRECTIONS

Alt. °	Sun's Low'r Limb ′	Venus ′	Mars ′
0			
	0.1	0.2	0.1
30			
	0.1	0.2	0.0
45			
	0.1	0.1	0.0
60			
	0.1	0.1	0.0
75			
	0.1	0.0	0.0
90			

Moon's Lower Limb

Add

Alt. °	27 ′	28 ′	29 ′
0			
	14.0	13.1	12.6
4			
	14.0	13.1	12.6
8			
	14.0	13.2	12.7
12			
	14.1	13.2	12.7
16			
	14.1	13.2	12.7
20			
	14.1	13.3	12.8
24			
	14.1	13.3	12.9
28			
	14.2	13.4	12.9
32			
	14.2	13.5	13.0
36			
	14.3	13.5	13.1
40			
	14.3	13.6	13.2
44			
	14.4	13.7	13.3
48			
	14.5	13.8	13.4
52			
	14.5	13.9	13.6
56			
	14.6	14.0	13.7
60			
	14.7	14.1	13.8
64			
	14.7	14.3	14.0
68			
	14.8	14.4	14.1
72			
	14.9	14.5	14.3
76			
	15.0	14.6	14.4
80			
	15.1	14.8	14.6
84			
	15.1	14.9	14.8
88			
	15.2	15.0	14.9
90			

Add to table, back cover

Moon's Upper Limb

Subtract

Alt. °	27 ′	28 ′	29 ′
0			
	16.4	16.9	17.2
4			
	16.4	16.9	17.2
8			
	16.4	16.9	17.2
12			
	16.4	16.9	17.2
16			
	16.4	16.8	17.1
20			
	16.3	16.8	17.1
24			
	16.3	16.7	17.0
28			
	16.3	16.7	16.9
32			
	16.2	16.6	16.8
36			
	16.2	16.5	16.7
40			
	16.1	16.4	16.6
44			
	16.1	16.4	16.5
48			
	16.0	16.3	16.4
52			
	15.9	16.2	16.3
56			
	15.9	16.0	16.1
60			
	15.8	15.9	16.0
64			
	15.7	15.8	15.9
68			
	15.6	15.7	15.7
72			
	15.6	15.6	15.6
76			
	15.5	15.4	15.4
80			
	15.4	15.3	15.2
84			
	15.3	15.2	15.1
88			
	15.2	15.1	15.0
90			

Subtract from table, back cover

GCT	♈ GHA	VENUS −4.0 GHA	VENUS Dec.	MARS 1.8 GHA	MARS Dec.	JUPITER −2.0 GHA	JUPITER Dec.	SATURN 1.3 GHA	SATURN Dec.	MOON GHA	code	MOON Dec.	code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
0	277 15.3	131 44.1	+15 07.3	190 12.6	+24 00.6	265 30.9	+ 3 38.3	99 39.3	+ 3 32.4	230 57.6	127	+22 16.3	+ 92
1	292 17.7	146 44.4	06.4	205 13.2	00.7	280 33.1	38.4	114 41.6	32.3	245 29.3	125	22 25.5	+ 91
2	307 20.2	161 44.7	05.4	220 13.8	00.7	295 35.3	38.5	129 44.0	32.2	260 00.8	125	22 34.6	+ 90
3	322 22.7	176 44.9	·· 04.5	235 14.4	·· 00.8	310 37.5	·· 38.6	144 46.3	·· 32.2	274 32.3	125	·22 43.6	+ 88
4	337 25.1	191 45.2	03.5	250 15.0	00.8	325 39.7	38.7	159 48.7	32.1	289 03.8	124	22 52.4	+ 88
5	352 27.6	206 45.5	02.6	265 15.7	00.9	340 41.9	38.8	174 51.0	32.1	303 35.2	124	23 01.2	+ 86
6	7 30.1	221 45.8	+15 01.6	280 16.3	+24 00.9	355 44.2	+ 3 38.9	189 53.4	+ 3 32.0	318 06.6	123	+23 09.8	+ 86
7	22 32.5	236 46.1	15 00.7	295 16.9	01.0	10 46.4	39.0	204 55.7	31.9	332 37.9	122	23 18.4	+ 84
8	37 35.0	251 46.4	14 59.7	310 17.5	01.1	25 48.6	39.1	219 58.0	31.9	347 09.1	122	23 26.8	+ 83
9	52 37.5	266 46.7	·· 58.8	325 18.1	·· 01.1	40 50.8	·· 39.2	235 00.4	·· 31.8	1 40.3	122	·23 35.1	+ 83
10	67 39.9	281 46.9	57.8	340 18.7	01.2	55 53.0	39.3	250 02.7	31.8	16 11.5	121	23 43.4	+ 81
11	82 42.4	296 47.2	56.9	355 19.3	01.2	70 55.2	39.4	265 05.1	31.7	30 42.6	120	23 51.5	+ 80
12	97 44.8	311 47.5	+14 55.9	10 19.9	+24 01.3	85 57.4	+ 3 39.4	280 07.4	+ 3 31.6	45 13.6	120	+23 59.5	+ 79
13	112 47.3	326 47.8	55.0	25 20.5	01.3	100 59.7	39.5	295 09.8	31.6	59 44.6	119	24 07.4	+ 78
14	127 49.8	341 48.1	54.0	40 21.1	01.4	116 01.9	39.6	310 12.1	31.5	74 15.5	119	24 15.2	+ 77
15	142 52.2	356 48.4	·· 53.1	55 21.7	·· 01.4	131 04.1	·· 39.7	325 14.5	·· 31.5	88 46.4	118	·24 22.9	+ 75
16	157 54.7	11 48.7	52.1	70 22.4	01.5	146 06.3	39.8	340 16.8	31.4	103 17.2	118	24 30.4	+ 75
17	172 57.2	26 49.0	51.2	85 23.0	01.5	161 08.5	39.9	355 19.2	31.3	117 48.0	117	24 37.9	+ 73
18	187 59.6	41 49.3	+14 50.2	100 23.6	+24 01.6	176 10.7	+ 3 40.0	10 21.5	+ 3 31.3	132 18.7	116	+24 45.2	+ 72
19	203 02.1	56 49.6	49.3	115 24.2	01.6	191 13.0	40.1	25 23.8	31.2	146 49.3	116	24 52.4	+ 71
20	218 04.6	71 49.9	48.3	130 24.8	01.7	206 15.2	40.2	40 26.2	31.2	161 19.9	116	24 59.5	+ 70
21	233 07.0	86 50.2	·· 47.4	145 25.4	·· 01.7	221 17.4	·· 40.3	55 28.5	·· 31.1	175 50.5	115	·25 06.5	+ 69
22	248 09.5	101 50.5	46.4	160 26.0	01.8	236 19.6	40.4	70 30.9	31.0	190 21.0	115	25 13.4	+ 68
23	263 12.0	116 50.8	45.4	175 26.6	01.8	251 21.8	40.5	85 33.2	31.0	204 51.5	114	25 20.2	+ 66
0	278 14.4	131 51.1	+14 44.5	190 27.2	+24 01.9	266 24.1	+ 3 40.6	100 35.6	+ 3 30.9	219 21.9	113	+25 26.8	+ 65
1	293 16.9	146 51.5	43.5	205 27.8	01.9	281 26.3	40.6	115 37.9	30.9	233 52.2	113	25 33.3	+ 64
2	308 19.3	161 51.8	42.6	220 28.4	02.0	296 28.5	40.7	130 40.3	30.8	248 22.5	113	25 39.7	+ 63
3	323 21.8	176 52.1	·· 41.6	235 29.1	·· 02.0	311 30.7	·· 40.8	145 42.6	·· 30.7	262 52.8	112	·25 46.0	+ 62
4	338 24.3	191 52.4	40.7	250 29.7	02.1	326 32.9	40.9	160 44.9	30.7	277 23.0	112	25 52.2	+ 60
5	353 26.7	206 52.7	39.7	265 30.3	02.1	341 35.2	41.0	175 47.3	30.6	291 53.2	111	25 58.2	+ 60
6	8 29.2	221 53.0	+14 38.8	280 30.9	+24 02.2	356 37.4	+ 3 41.1	190 49.6	+ 3 30.5	306 23.3	111	+26 04.2	+ 58
7	23 31.7	236 53.3	37.8	295 31.5	02.2	11 39.6	41.2	205 52.0	30.5	320 53.4	110	26 10.0	+ 56
8	38 34.1	251 53.7	36.8	310 32.1	02.3	26 41.8	41.3	220 54.3	30.4	335 23.4	110	26 15.6	+ 56
9	53 36.6	266 54.0	·· 35.9	325 32.7	·· 02.3	41 44.0	·· 41.4	235 56.7	·· 30.4	349 53.4	109	·26 21.2	+ 54
10	68 39.1	281 54.3	34.9	340 33.3	02.3	56 46.3	41.5	250 59.0	30.3	4 23.3	109	26 26.6	+ 53
11	83 41.5	296 54.6	34.0	355 33.9	02.4	71 48.5	41.6	266 01.4	30.2	18 53.2	108	26 31.9	+ 52
12	98 44.0	311 54.9	+14 33.0	10 34.6	+24 02.4	86 50.7	+ 3 41.6	281 03.7	+ 3 30.2	33 23.0	108	+26 37.1	+ 51
13	113 46.5	326 55.3	32.1	25 35.2	02.5	101 52.9	41.7	296 06.0	30.1	47 52.8	108	26 42.2	+ 49
14	128 48.9	341 55.6	31.1	40 35.8	02.5	116 55.1	41.8	311 08.4	30.1	62 22.6	107	26 47.1	+ 48
15	143 51.4	356 55.9	·· 30.1	55 36.4	·· 02.6	131 57.4	·· 41.9	326 10.7	·· 30.0	76 52.3	107	·26 51.9	+ 47
16	158 53.8	11 56.2	29.2	70 37.0	02.6	146 59.6	42.0	341 13.1	29.9	91 22.0	106	26 56.6	+ 45
17	173 56.3	26 56.6	28.2	85 37.6	02.6	162 01.8	42.1	356 15.4	29.9	105 51.6	106	27 01.1	+ 44
18	188 58.8	41 56.9	+14 27.3	100 38.2	+24 02.7	177 04.0	+ 3 42.2	11 17.8	+ 3 29.8	120 21.2	106	+27 05.5	+ 43
19	204 01.2	56 57.2	26.3	115 38.8	02.7	192 06.3	42.3	26 20.1	29.7	134 50.8	105	27 09.8	+ 42
20	219 03.7	71 57.6	25.3	130 39.4	02.8	207 08.5	42.4	41 22.4	29.7	149 20.3	105	27 14.0	+ 40
21	234 06.2	86 57.9	·· 24.4	145 40.0	·· 02.8	222 10.7	·· 42.5	56 24.8	·· 29.6	163 49.8	105	·27 18.0	+ 39
22	249 08.6	101 58.2	23.4	160 40.7	02.9	237 12.9	42.5	71 27.1	29.6	178 19.3	104	27 21.9	+ 38
23	264 11.1	116 58.6	22.5	175 41.3	02.9	252 15.2	42.6	86 29.5	29.5	192 48.7	104	27 25.7	+ 37
0	279 13.6	131 58.9	+14 21.5	190 41.9	+24 02.9	267 17.4	+ 3 42.7	101 31.8	+ 3 29.4	207 18.1	103	+27 29.4	+ 35
1	294 16.0	146 59.3	20.5	205 42.5	03.0	282 19.6	42.8	116 34.1	29.4	221 47.4	104	27 32.9	+ 33
2	309 18.5	161 59.6	19.6	220 43.1	03.0	297 21.8	42.9	131 36.5	29.3	236 16.8	103	27 36.2	+ 33
3	324 20.9	177 00.0	·· 18.6	235 43.7	·· 03.0	312 24.1	·· 43.0	146 38.8	·· 29.3	250 46.1	102	·27 39.5	+ 31
4	339 23.4	192 00.3	17.7	250 44.3	03.1	327 26.3	43.1	161 41.2	29.2	265 15.3	103	27 42.6	+ 30
5	354 25.9	207 00.6	16.7	265 44.9	03.1	342 28.5	43.2	176 43.5	29.1	279 44.6	102	27 45.6	+ 28
6	9 28.3	222 01.0	+14 15.7	280 45.6	+24 03.2	357 30.7	+ 3 43.3	191 45.8	+ 3 29.1	294 13.8	102	+27 48.4	+ 28
7	24 30.8	237 01.3	14.8	295 46.2	03.2	12 33.0	43.3	206 48.2	29.0	308 43.0	101	27 51.2	+ 25
8	39 33.3	252 01.7	13.8	310 46.8	03.2	27 35.2	43.4	221 50.5	28.9	323 12.1	102	27 53.7	+ 25
9	54 35.7	267 02.0	·· 12.8	325 47.4	·· 03.3	42 37.4	·· 43.5	236 52.9	·· 28.9	337 41.3	101	·27 56.2	+ 23
10	69 38.2	282 02.4	11.9	340 48.0	03.3	57 39.6	43.6	251 55.2	28.8	352 10.4	101	27 58.5	+ 22
11	84 40.7	297 02.7	10.9	355 48.6	03.3	72 41.9	43.7	266 57.5	28.8	6 39.5	100	28 00.7	+ 20
12	99 43.1	312 03.1	+14 10.0	10 49.2	+24 03.4	87 44.1	+ 3 43.8	281 59.9	+ 3 28.7	21 08.5	101	+28 02.7	+ 19
13	114 45.6	327 03.5	09.0	25 49.8	03.4	102 46.3	43.9	297 02.2	28.6	35 37.6	100	28 04.6	+ 18
14	129 48.1	342 03.8	08.0	40 50.4	03.4	117 48.6	44.0	312 04.6	28.6	50 06.6	101	28 06.4	+ 17
15	144 50.5	357 04.2	·· 07.1	55 51.1	·· 03.5	132 50.8	·· 44.0	327 06.9	·· 28.5	64 35.7	100	·28 08.1	+ 15
16	159 53.0	12 04.5	06.1	70 51.7	03.5	147 53.0	44.1	342 09.2	28.4	79 04.7	100	28 09.6	+ 13
17	174 55.4	27 04.9	05.1	85 52.3	03.6	162 55.2	44.2	357 11.6	28.4	93 33.7	99	28 10.9	+ 13
18	189 57.9	42 05.3	+14 04.2	100 52.9	+24 03.6	177 57.5	+ 3 44.3	12 13.9	+ 3 28.3	108 02.6	100	+28 12.2	+ 11
19	205 00.4	57 05.6	03.2	115 53.5	03.6	192 59.7	44.4	27 16.3	28.2	122 31.6	100	28 13.3	+ 9
20	220 02.8	72 06.0	02.2	130 54.1	03.6	208 01.9	44.5	42 18.6	28.2	137 00.6	99	28 14.2	+ 8
21	235 05.3	87 06.4	·· 01.3	145 54.7	·· 03.7	223 04.2	·· 44.6	57 20.9	·· 28.1	151 29.5	99	·28 15.0	+ 7
22	250 07.8	102 06.7	14 00.3	160 55.3	03.7	238 06.4	44.7	72 23.3	28.1	165 58.4	100	28 15.7	+ 6
23	265 10.2	117 07.1	13 59.3	175 56.0	03.7	253 08.6	44.7	87 25.6	28.0	180 27.4	99	28 16.3	+ 4
24	280 12.7	132 07.5	+13 58.4	190 56.6	+24 03.8	268 10.9	+ 3 44.8	102 27.9	+ 3 27.9	194 56.3	99	+28 16.7	+ 3
code	—	+ 4	− 9	+ 6	+ 1	+ 22	+ 1	+ 23	− 1				

GCT	SUN GHA	SUN Dec.
h	° ′	° ′
0	179 10.8	+23 14.4
1	194 10.7	14.3
2	209 10.6	14.2
3	224 10.5	·· 14.0
4	239 10.3	13.9
5	254 10.2	13.8
6	269 10.1	+23 13.6
7	284 10.0	13.5
8	299 09.8	13.3
9	314 09.7	·· 13.2
10	329 09.6	13.1
11	344 09.5	12.9
12	359 09.3	+23 12.8
13	14 09.2	12.6
14	29 09.1	12.5
15	44 09.0	·· 12.4
16	59 08.8	12.2
17	74 08.7	12.1
18	89 08.6	+23 11.9
19	104 08.5	11.8
20	119 08.3	11.6
21	134 08.2	·· 11.5
22	149 08.1	11.3
23	164 08.0	11.2
0	179 07.8	+23 11.0
1	194 07.7	10.9
2	209 07.6	10.7
3	224 07.5	·· 10.6
4	239 07.3	10.4
5	254 07.2	10.3
6	269 07.1	+23 10.1
7	284 07.0	10.0
8	299 06.8	09.8
9	314 06.7	·· 09.7
10	329 06.6	09.5
11	344 06.5	09.3
12	359 06.4	+23 09.2
13	14 06.2	09.0
14	29 06.1	08.9
15	44 06.0	·· 08.7
16	59 05.9	08.5
17	74 05.7	08.4
18	89 05.6	+23 08.2
19	104 05.5	08.1
20	119 05.4	07.9
21	134 05.2	·· 07.7
22	149 05.1	07.6
23	164 05.0	07.4
0	179 04.9	+23 07.2
1	194 04.8	07.1
2	209 04.6	06.9
3	224 04.5	·· 06.7
4	239 04.4	06.6
5	254 04.3	06.4
6	269 04.2	+23 06.2
7	284 04.0	06.0
8	299 03.9	05.9
9	314 03.8	·· 05.7
10	329 03.7	05.5
11	344 03.5	05.3
12	359 03.4	+23 05.2
13	14 03.3	05.0
14	29 03.2	04.8
15	44 03.1	·· 04.6
16	59 02.9	04.5
17	74 02.8	04.3
18	89 02.7	+23 04.1
19	104 02.6	03.9
20	119 02.5	03.7
21	134 02.3	·· 03.6
22	149 02.2	03.4
23	164 02.1	03.2
24	179 02.0	+23 03.0
code	—	− 2

STARS No.	SHA	Dec.	Transit Mer. Gr.
	° ′	° ′	h m
1	358 31.8	+28 49.3	5 32
2	358 21.4	+58 52.7	5 33
3	349 42.6	−18 15.0	6 07
4	339 20.9	+59 58.8	6 49
5	336 01.3	−57 28.6	7 02
6	332 45.9	+89 01.9	7 15
7	328 53.6	+23 14.0	7 30
8	315 53.8	−40 29.6	8 22
9	309 47.6	+49 41.4	8 46
10	291 43.2	+16 24.9	9 59
11	281 57.2	− 8 15.2	10 37
12	281 43.8	+45 57.1	10 38
13	279 22.3	+ 6 18.6	10 48
14	279 11.9	+28 34.2	10 48
15	276 34.0	− 1 13.7	10 59
16	271 52.1	+ 7 24.1	11 18
17	264 17.4	−52 39.9	11 48
18	259 15.1	−16 38.7	12 08
19	255 49.6	−28 54.2	12 22
20	245 48.8	+ 5 21.2	13 02
21	244 25.0	+28 08.9	13 07
22	234 37.9	−59 21.2	13 46
23	223 27.3	−43 14.2	14 31
24	221 50.8	−69 31.2	14 37
25	218 42.1	− 8 26.8	14 50
26	208 33.2	+12 12.4	15 30
27	194 48.7	+62 01.1	16 25
28	183 21.2	+14 50.7	17 11
29	174 01.9	−62 50.2	17 48
30	172 53.2	−56 50.8	17 53
31	168 47.0	−59 25.8	18 09
32	167 01.2	+56 13.6	18 16
33	159 30.0	+55 10.9	18 46
34	159 20.4	−10 54.6	18 47
35	153 35.2	+49 33.5	19 10
36	149 02.5	−36 08.2	19 28
37	146 38.0	+19 26.1	19 37
38	140 55.5	−60 38.6	20 00
39	137 16.6	+74 21.4	20 15
40	126 50.1	+26 52.6	20 56
41	120 37.7	−22 29.3	21 21
42	113 23.2	−26 19.8	21 50
43	109 06.5	−68 56.8	22 07
44	103 05.7	−15 40.1	22 31
45	97 24.8	−37 04.4	22 54
46	96 49.4	+12 35.5	22 56
47	91 07.3	+51 29.6	23 19
48	84 45.2	−34 24.7	23 44
49	81 10.1	+38 44.1	0 02
50	76 55.6	−26 21.6	0 19
51	62 53.4	+ 8 44.2	1 15
52	54 31.9	−56 53.5	1 49
53	50 03.0	+45 06.2	2 06
54	34 32.7	+ 9 39.0	3 08
55	28 41.7	−47 11.6	3 32
56	16 15.0	−29 52.6	4 21
57	14 24.7	+14 56.6	4 29

Lat.	Sunrise	Twlt. begins	Moonrise 30	Moonrise 1	Moonrise 2	Moonrise 3
N °	h m	h m	h m	h m	h m	h m
70	▭	▭	▭	▭	▭	▭
68	▭	▭	▭	▭	▭	▭
66	▭	▭		▭	▭	▭
64	1 40	////	22 21	▭	▭	▭
62	2 16	////	23 11	23 03	▭	▭
60	2 41	////	23 42	23 55	24 29	0 29
58	3 01	////	24 06	0 06	0 27	1 06
56	3 18	////	0 08	0 25	0 51	1 33
54	3 31	////	0 20	0 41	1 11	1 54
52	3 44	////	0 31	0 54	1 27	2 12
50	3 54	////	0 41	1 06	1 41	2 27
45	4 17	1 45	1 01	1 32	2 10	2 57
40	4 34	2 32	1 18	1 52	2 32	3 20
35	4 49	3 02	1 32	2 09	2 51	3 40
30	5 02	3 26	1 45	2 23	3 07	3 56
20	5 24	4 00	2 06	2 48	3 34	4 25
10	5 43	4 24	2 24	3 10	3 58	4 49
0	6 00	4 45	2 42	3 30	4 20	5 11
10	6 17	5 02	2 59	3 50	4 42	5 34
20	6 36	5 16	3 18	4 12	5 06	5 58
30	6 56	5 31	3 40	4 37	5 34	6 26
35	7 09	5 38	3 53	4 52	5 50	6 43
40	7 23	5 44	4 08	5 10	6 09	7 03
45	7 39	5 52	4 25	5 31	6 32	7 26
50	8 00	6 01	4 48	5 58	7 02	7 57
52	8 09	6 04	4 58	6 11	7 17	8 12
54	8 20	6 08	5 10	6 26	7 34	8 30
56	8 33	6 11	5 24	6 44	7 55	8 51
58	8 47	6 16	5 40	7 05	8 21	9 18
60	9 04	6 20	6 00	7 33	8 58	9 57
S						

Lat.	Sunset	Twlt. ends	Moonset 30	Moonset 1	Moonset 2	Moonset 3
N °	h m	h m	h m	h m	h m	h m
70	▭	▭	▭	▭	▭	▭
68	▭	▭	▭	▭	▭	▭
66	23 47	▭	▭	▭	▭	▭
64	22 26	////	20 04	▭	▭	▭
62	21 51	////	19 15	21 06	▭	23 12
60	21 25	////	18 44	20 14	21 27	22 09
58	21 06	////	18 21	19 42	20 50	21 35
56	20 49	////	18 02	19 18	20 23	21 10
54	20 35	////	17 47	18 59	20 02	20 50
52	20 23	////	17 33	18 43	19 44	20 33
50	20 13	////	17 22	18 29	19 29	20 18
45	19 51	22 22	16 57	18 01	18 59	19 49
40	19 33	21 35	16 38	17 39	18 36	19 26
35	19 18	21 04	16 22	17 21	18 16	19 07
30	19 05	20 41	16 08	17 05	18 00	18 50
20	18 43	20 07	15 44	16 38	17 31	18 23
10	18 25	19 43	15 24	16 15	17 07	17 59
0	18 07	19 22	15 05	15 54	16 45	17 36
10	17 50	19 05	14 46	15 33	16 22	17 14
20	17 32	18 51	14 26	15 10	15 58	16 50
30	17 11	18 36	14 02	14 44	15 30	16 22
35	16 59	18 30	13 49	14 28	15 14	16 05
40	16 45	18 22	13 33	14 10	14 54	15 46
45	16 28	18 14	13 14	13 48	14 31	15 22
50	16 08	18 07	12 51	13 21	14 01	14 52
52	15 58	18 03	12 40	13 07	13 46	14 37
54	15 47	18 00	12 28	12 52	13 28	14 19
56	15 35	17 57	12 13	12 34	13 07	13 58
58	15 21	17 53	11 56	12 12	12 41	13 31
60	15 04	17 49	11 36	11 44	12 04	12 53
S						

Equation of Time (App.—Mean)

GCT	30	1	2
h	m s	m s	m s
0	− 3 16.4	− 3 28.4	− 3 40.2
6	− 3 19.4	− 3 31.4	− 3 43.1
12	− 3 22.4	− 3 34.4	− 3 46.1
18	− 3 25.4	− 3 37.3	− 3 48.9
24	− 3 28.4	− 3 40.2	− 3 51.8

GCT of Transit Meridian of Greenwich

DAY	Moon	Venus	Mars	Jupiter	Saturn
	h m	h m	h m	h m	h m
30	8 53	15 13	11 19	6 17	17 19
1	9 42	15 12	11 18	6 14	17 15
2	10 32	15 12	11 17	6 10	17 11
3	11 24	15 11	11 16	6 06	17 08

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb	Venus	Mars
°	′	′	′
0			
	0.1	0.2	0.1
30			
	0.1	0.2	0.0
45			
	0.1	0.1	0.0
60			
	0.1	0.1	0.0
75			
	0.1	0.0	0.0
90			

Moon's Lower Limb
Add

Alt.	30	1	2
°	′	′	′
0			
	12.1	11.9	11.7
4			
	12.1	11.9	11.7
8			
	12.2	11.9	11.8
12			
	12.2	11.9	11.8
16			
	12.2	12.0	11.9
20			
	12.3	12.1	12.0
24			
	12.4	12.2	12.0
28			
	12.5	12.2	12.1
32			
	12.6	12.4	12.2
36			
	12.7	12.5	12.4
40			
	12.8	12.6	12.5
44			
	12.9	12.7	12.6
48			
	13.1	12.9	12.8
52			
	13.2	13.1	13.0
56			
	13.4	13.2	13.1
60			
	13.5	13.4	13.3
64			
	13.7	13.6	13.5
68			
	13.9	13.8	13.7
72			
	14.1	14.0	13.9
76			
	14.3	14.2	14.1
80			
	14.4	14.4	14.3
84			
	14.6	14.6	14.5
88			
	14.8	14.7	14.7
90			

Add to table, back cover

Moon's Upper Limb
Subtract

Alt.	30	1	2
°	′	′	′
0			
	17.5	17.7	17.7
4			
	17.5	17.6	17.7
8			
	17.5	17.6	17.7
12			
	17.4	17.6	17.6
16			
	17.4	17.5	17.6
20			
	17.3	17.5	17.5
24			
	17.2	17.4	17.4
28			
	17.2	17.3	17.3
32			
	17.1	17.2	17.2
36			
	16.9	17.0	17.1
40			
	16.8	16.9	17.0
44			
	16.7	16.8	16.8
48			
	16.6	16.6	16.7
52			
	16.4	16.5	16.5
56			
	16.2	16.3	16.3
60			
	16.1	16.1	16.1
64			
	15.9	15.9	16.0
68			
	15.7	15.8	15.8
72			
	15.6	15.6	15.6
76			
	15.4	15.4	15.4
80			
	15.2	15.2	15.2
84			
	15.0	15.0	14.9
88			
	14.9	14.8	14.8
90			

Subtract from table, back cover

GCT	♈	VENUS −4.0		MARS 1.8		JUPITER −2.0		SATURN 1.3		MOON			
	GHA	GHA	Dec.	GHA	Dec.	GHA	Dec.	GHA	Dec.	GHA	code	Dec.	code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
0	280 12.7	132 07.5	+13 58.4	190 56.6	+24 03.8	268 10.9	+ 3 44.8	102 27.9	+ 3 27.9	194 56.3	99	+28 16.7	+ 3
1	295 15.2	147 07.8	57.4	205 57.2	03.8	283 13.1	44.9	117 30.3	27.9	209 25.2	99	28 17.0	+ 1
2	310 17.6	162 08.2	56.4	220 57.8	03.8	298 15.3	45.0	132 32.6	27.8	223 54.1	99	28 17.1	0
3	325 20.1	177 08.6	·· 55.5	235 58.4	·· 03.9	313 17.6	·· 45.1	147 35.0	·· 27.7	238 23.0	100	·28 17.1	− 1
4	340 22.6	192 09.0	54.5	250 59.0	03.9	328 19.8	45.2	162 37.3	27.7	252 52.0	99	28 17.0	− 3
5	355 25.0	207 09.3	53.5	265 59.6	03.9	343 22.0	45.3	177 39.6	27.6	267 20.9	99	28 16.7	− 4
6	10 27.5	222 09.7	+13 52.6	281 00.2	+24 04.0	358 24.3	+ 3 45.3	192 42.0	+ 3 27.5	281 49.8	99	+28 16.3	− 6
7	25 29.9	237 10.1	51.6	296 00.9	04.0	13 26.5	45.4	207 44.3	27.5	296 18.7	100	28 15.7	− 7
8	40 32.4	252 10.5	50.6	311 01.5	04.0	28 28.7	45.5	222 46.6	27.4	310 47.7	99	28 15.0	− 8
9	55 34.9	267 10.9	·· 49.6	326 02.1	·· 04.0	43 31.0	·· 45.6	237 49.0	·· 27.4	325 16.6	99	·28 14.2	− 9
10	70 37.3	282 11.2	48.7	341 02.7	04.1	58 33.2	45.7	252 51.3	27.3	339 45.5	100	28 13.3	− 11
11	85 39.8	297 11.6	47.7	356 03.3	04.1	73 35.4	45.8	267 53.6	27.2	354 14.5	99	28 12.2	− 13
12	100 42.3	312 12.0	+13 46.7	11 03.9	+24 04.1	88 37.7	+ 3 45.9	282 56.0	+ 3 27.2	8 43.4	100	+28 10.9	− 13
13	115 44.7	327 12.4	45.8	26 04.5	04.1	103 39.9	45.9	297 58.3	27.1	23 12.4	100	28 09.6	− 15
14	130 47.2	342 12.8	44.8	41 05.2	04.2	118 42.1	46.0	313 00.7	27.0	37 41.4	100	28 08.1	− 17
15	145 49.7	357 13.2	·· 43.8	56 05.8	·· 04.2	133 44.4	·· 46.1	328 03.0	·· 27.0	52 10.4	100	·28 06.4	− 17
16	160 52.1	12 13.6	42.9	71 06.4	04.2	148 46.6	46.2	343 05.3	26.9	66 39.4	100	28 04.7	− 19
17	175 54.6	27 14.0	41.9	86 07.0	04.2	163 48.8	46.3	358 07.7	26.8	81 08.4	101	28 02.8	− 21
18	190 57.1	42 14.4	+13 40.9	101 07.6	+24 04.3	178 51.1	+ 3 46.4	13 10.0	+ 3 26.8	95 37.5	100	+28 00.7	− 22
19	205 59.5	57 14.8	39.9	116 08.2	04.3	193 53.3	46.4	28 12.3	26.7	110 06.5	101	27 58.5	− 23
20	221 02.0	72 15.1	39.0	131 08.8	04.3	208 55.5	46.5	43 14.7	26.6	124 35.6	101	27 56.2	− 24
21	236 04.4	87 15.5	·· 38.0	146 09.5	·· 04.3	223 57.8	·· 46.6	58 17.0	·· 26.6	139 04.7	102	·27 53.8	− 26
22	251 06.9	102 15.9	37.0	161 10.1	04.4	239 00.0	46.7	73 19.3	26.5	153 33.9	101	27 51.2	− 27
23	266 09.4	117 16.4	36.0	176 10.7	04.4	254 02.3	46.8	88 21.7	26.4	168 03.0	102	27 48.5	− 29
0	281 11.8	132 16.8	+13 35.1	191 11.3	+24 04.4	269 04.5	+ 3 46.9	103 24.0	+ 3 26.4	182 32.2	102	+27 45.6	− 30
1	296 14.3	147 17.2	34.1	206 11.9	04.4	284 06.7	46.9	118 26.3	26.3	197 01.4	102	27 42.6	− 31
2	311 16.8	162 17.6	33.1	221 12.5	04.5	299 09.0	47.0	133 28.7	26.3	211 30.6	102	27 39.5	− 33
3	326 19.2	177 18.0	·· 32.2	236 13.1	·· 04.5	314 11.2	·· 47.1	148 31.0	·· 26.2	225 59.8	103	·27 36.2	− 33
4	341 21.7	192 18.4	31.2	251 13.8	04.5	329 13.4	47.2	163 33.3	26.1	240 29.1	103	27 32.9	− 36
5	356 24.2	207 18.8	30.2	266 14.4	04.5	344 15.7	47.3	178 35.7	26.1	254 58.4	104	27 29.3	− 36
6	11 26.6	222 19.2	+13 29.2	281 15.0	+24 04.5	359 17.9	+ 3 47.4	193 38.0	+ 3 26.0	269 27.8	104	+27 25.7	− 38
7	26 29.1	237 19.6	28.3	296 15.6	04.6	14 20.2	47.4	208 40.3	25.9	283 57.2	104	27 21.9	− 39
8	41 31.6	252 20.0	27.3	311 16.2	04.6	29 22.4	47.5	223 42.7	25.9	298 26.6	104	27 18.0	− 40
9	56 34.0	267 20.4	·· 26.3	326 16.8	·· 04.6	44 24.6	·· 47.6	238 45.0	·· 25.8	312 56.0	105	·27 14.0	− 42
10	71 36.5	282 20.9	25.3	341 17.4	04.6	59 26.9	47.7	253 47.3	25.7	327 25.5	105	27 09.8	− 43
11	86 38.9	297 21.3	24.4	356 18.1	04.6	74 29.1	47.8	268 49.7	25.7	341 55.0	106	27 05.5	− 44
12	101 41.4	312 21.7	+13 23.4	11 18.7	+24 04.6	89 31.4	+ 3 47.9	283 52.0	+ 3 25.6	356 24.6	105	+27 01.1	− 46
13	116 43.9	327 22.1	22.4	26 19.3	04.7	104 33.6	47.9	298 54.3	25.5	10 54.1	107	26 56.5	− 47
14	131 46.3	342 22.5	21.4	41 19.9	04.7	119 35.8	48.0	313 56.7	25.5	25 23.8	106	26 51.8	− 48
15	146 48.8	357 23.0	·· 20.5	56 20.5	·· 04.7	134 38.1	·· 48.1	328 59.0	·· 25.4	39 53.4	107	·26 47.0	− 50
16	161 51.3	12 23.4	19.5	71 21.1	04.7	149 40.3	48.2	344 01.3	25.3	54 23.1	108	26 42.0	− 50
17	176 53.7	27 23.8	18.5	86 21.8	04.7	164 42.6	48.3	359 03.7	25.3	68 52.9	108	26 37.0	− 52
18	191 56.2	42 24.2	+13 17.5	101 22.4	+24 04.7	179 44.8	+ 3 48.3	14 06.0	+ 3 25.2	83 22.7	108	+26 31.8	− 53
19	206 58.7	57 24.7	16.5	116 23.0	04.8	194 47.0	48.4	29 08.3	25.1	97 52.5	109	26 26.5	− 55
20	222 01.1	72 25.1	15.6	131 23.6	04.8	209 49.3	48.5	44 10.7	25.1	112 22.4	109	26 21.0	− 55
21	237 03.6	87 25.5	·· 14.6	146 24.2	·· 04.8	224 51.5	·· 48.6	59 13.0	·· 25.0	126 52.3	110	·26 15.5	− 57
22	252 06.0	102 26.0	13.6	161 24.8	04.8	239 53.8	48.7	74 15.3	24.9	141 22.3	110	26 09.8	− 59
23	267 08.5	117 26.4	12.6	176 25.4	04.8	254 56.0	48.7	89 17.7	24.9	155 52.3	111	26 03.9	− 59
0	282 11.0	132 26.8	+13 11.7	191 26.1	+24 04.8	269 58.3	+ 3 48.8	104 20.0	+ 3 24.8	170 22.4	111	+25 58.0	− 61
1	297 13.4	147 27.3	10.7	206 26.7	04.8	285 00.5	48.9	119 22.3	24.7	184 52.5	111	25 51.9	− 61
2	312 15.9	162 27.7	09.7	221 27.3	04.9	300 02.8	49.0	134 24.6	24.7	199 22.6	112	25 45.8	− 63
3	327 18.4	177 28.1	·· 08.7	236 27.9	·· 04.9	315 05.0	·· 49.1	149 27.0	·· 24.6	213 52.8	113	·25 39.5	− 65
4	342 20.8	192 28.6	07.7	251 28.5	04.9	330 07.2	49.1	164 29.3	24.5	228 23.1	113	25 33.0	− 65
5	357 23.3	207 29.0	06.8	266 29.1	04.9	345 09.5	49.2	179 31.6	24.5	242 53.4	113	25 26.5	− 67
6	12 25.8	222 29.5	+13 05.8	281 29.8	+24 04.9	0 11.7	+ 3 49.3	194 34.0	+ 3 24.4	257 23.7	114	+25 19.8	− 67
7	27 28.2	237 29.9	04.8	296 30.4	04.9	15 14.0	49.4	209 36.3	24.3	271 54.1	115	25 13.1	− 69
8	42 30.7	252 30.4	03.8	311 31.0	04.9	30 16.2	49.5	224 38.6	24.3	286 24.6	115	25 06.2	− 70
9	57 33.2	267 30.8	·· 02.8	326 31.6	·· 04.9	45 18.5	·· 49.5	239 41.0	·· 24.2	300 55.1	116	·24 59.2	− 72
10	72 35.6	282 31.3	01.9	341 32.2	04.9	60 20.7	49.6	254 43.3	24.1	315 25.7	116	24 52.0	− 72
11	87 38.1	297 31.7	13 00.9	356 32.8	05.0	75 23.0	49.7	269 45.6	24.1	329 56.3	117	24 44.8	− 74
12	102 40.5	312 32.2	+12 59.9	11 33.5	+24 05.0	90 25.2	+ 3 49.8	284 47.9	+ 3 24.0	344 27.0	117	+24 37.4	− 74
13	117 43.0	327 32.6	58.9	26 34.1	05.0	105 27.5	49.9	299 50.3	23.9	358 57.7	118	24 30.0	− 76
14	132 45.5	342 33.1	57.9	41 34.7	05.0	120 29.7	49.9	314 52.6	23.9	13 28.5	118	24 22.4	− 77
15	147 47.9	357 33.5	·· 57.0	56 35.3	·· 05.0	135 32.0	·· 50.0	329 54.9	·· 23.8	27 59.3	119	·24 14.7	− 78
16	162 50.4	12 34.0	56.0	71 35.9	05.0	150 34.2	50.1	344 57.3	23.7	42 30.2	119	24 06.9	− 79
17	177 52.9	27 34.4	55.0	86 36.6	05.0	165 36.4	50.2	359 59.6	23.7	57 01.1	120	23 59.0	− 81
18	192 55.3	42 34.9	+12 54.0	101 37.2	+24 05.0	180 38.7	+ 3 50.3	15 01.9	+ 3 23.6	71 32.1	121	+23 50.9	− 81
19	207 57.8	57 35.4	53.0	116 37.8	05.0	195 40.9	50.3	30 04.2	23.5	86 03.2	121	23 42.8	− 82
20	223 00.3	72 35.8	52.1	131 38.4	05.0	210 43.2	50.4	45 06.6	23.5	100 34.3	122	23 34.6	− 84
21	238 02.7	87 36.3	·· 51.1	146 39.0	·· 05.0	225 45.4	·· 50.5	60 08.9	·· 23.4	115 05.5	122	·23 26.2	− 85
22	253 05.2	102 36.8	50.1	161 39.6	05.0	240 47.7	50.6	75 11.2	23.3	129 36.7	123	23 17.7	− 85
23	268 07.7	117 37.2	49.1	176 40.3	05.0	255 49.9	50.7	90 13.6	23.3	144 08.0	123	23 09.2	− 87
24	283 10.1	132 37.7	+12 48.1	191 40.9	+24 05.0	270 52.2	+ 3 50.7	105 15.9	+ 3 23.2	158 39.3	124	+23 00.5	− 88
code	—	+ 4	− 10	+ 6	+ 1	+ 22	0	+ 23	− 1				

GCT	SUN GHA	SUN Dec.
h	° ′	° ′
0	179 02.0	+23 03.0
1	194 01.9	02.8
2	209 01.7	02.6
3	224 01.6 ••	02.5
4	239 01.5	02.3
5	254 01.4	02.1
6	269 01.3	+23 01.9
7	284 01.2	01.7
8	299 01.0	01.5
9	314 00.9 ••	01.3
10	329 00.8	01.1
11	344 00.7	00.9
12	359 00.6	+23 00.8
13	14 00.4	00.6
14	29 00.3	00.4
15	44 00.2 ••	00.2
16	59 00.1	23 00.0
17	74 00.0	22 59.8
18	88 59.9	+22 59.6
19	103 59.7	59.4
20	118 59.6	59.2
21	133 59.5 ••	59.0
22	148 59.4	58.8
23	163 59.3	58.6
0	178 59.2	+22 58.4
1	193 59.0	58.2
2	208 58.9	58.0
3	223 58.8 ••	57.8
4	238 58.7	57.6
5	253 58.6	57.4
6	268 58.5	+22 57.2
7	283 58.3	57.0
8	298 58.2	56.8
9	313 58.1 ••	56.6
10	328 58.0	56.4
11	343 57.9	56.1
12	358 57.8	+22 55.9
13	13 57.7	55.7
14	28 57.5	55.5
15	43 57.4 ••	55.3
16	58 57.3	55.1
17	73 57.2	54.9
18	88 57.1	+22 54.7
19	103 57.0	54.5
20	118 56.9	54.2
21	133 56.8 ••	54.0
22	148 56.6	53.8
23	163 56.5	53.6
0	178 56.4	+22 53.4
1	193 56.3	53.2
2	208 56.2	52.9
3	223 56.1 ••	52.7
4	238 56.0	52.5
5	253 55.8	52.3
6	268 55.7	+22 52.1
7	283 55.6	51.8
8	298 55.5	51.6
9	313 55.4 ••	51.4
10	328 55.3	51.2
11	343 55.2	50.9
12	358 55.1	+22 50.7
13	13 55.0	50.5
14	28 54.8	50.3
15	43 54.7 ••	50.0
16	58 54.6	49.8
17	73 54.5	49.6
18	88 54.4	+22 49.4
19	103 54.3	49.1
20	118 54.2	48.9
21	133 54.1 ••	48.7
22	148 54.0	48.4
23	163 53.9	48.2
24	178 53.7	+22 48.0
code	—	– 2

STARS No.	SHA	Dec.	Transit Mer. Gr.
	° ′	° ′	h m
1	358 31.8	+28 49.3	5 20
2	358 21.4	+58 52.7	5 21
3	349 42.5	−18 15.0	5 55
4	339 20.9	+59 58.8	6 37
5	336 01.2	−57 28.6	6 50
6	332 44.9	+89 01.9	7 03
7	328 53.6	+23 14.0	7 18
8	315 53.8	−40 29.6	8 10
9	309 47.6	+49 41.4	8 35
10	291 43.2	+16 24.9	9 47
11	281 57.1	− 8 15.2	10 26
12	281 43.8	+45 57.1	10 27
13	279 22.3	+ 6 18.6	10 36
14	279 11.9	+28 34.2	10 37
15	276 34.0	− 1 13.7	10 47
16	271 52.1	+ 7 24.1	11 06
17	264 17.4	−52 39.9	11 36
18	259 15.1	−16 38.7	11 56
19	255 49.6	−28 54.2	12 10
20	245 48.8	+ 5 21.2	12 50
21	244 25.0	+28 08.9	12 55
22	234 37.9	−59 21.2	13 34
23	223 27.3	−43 14.2	14 19
24	221 50.9	−69 31.1	14 25
25	218 42.1	− 8 26.8	14 38
26	208 33.2	+12 12.4	15 18
27	194 48.7	+62 01.1	16 13
28	183 21.2	+14 50.7	16 59
29	174 01.9	−62 50.2	17 36
30	172 53.2	−56 50.8	17 41
31	168 47.1	−59 25.8	17 57
32	167 01.2	+56 13.6	18 04
33	159 30.0	+55 10.9	18 34
34	159 20.4	−10 54.6	18 35
35	153 35.2	+49 33.5	18 58
36	149 02.6	−36 08.2	19 16
37	146 38.0	+19 26.1	19 25
38	140 55.5	−60 38.6	19 48
39	137 16.6	+74 21.4	20 03
40	126 50.1	+26 52.6	20 44
41	120 37.7	−22 29.3	21 09
42	113 23.2	−26 19.8	21 38
43	109 06.5	−68 56.8	21 55
44	103 05.7	−15 40.1	22 19
45	97 24.8	−37 04.4	22 42
46	96 49.4	+12 35.5	22 44
47	91 07.3	+51 29.6	23 07
48	84 45.2	−34 24.7	23 32
49	81 10.1	+38 44.2	23 47
50	76 55.6	−26 21.6	0 07
51	62 53.4	+ 8 44.2	1 03
52	54 31.8	−56 53.5	1 37
53	50 02.9	+45 06.2	1 55
54	34 32.6	+ 9 39.1	2 57
55	28 41.7	−47 11.6	3 20
56	16 15.0	−29 52.6	4 10
57	14 24.7	+14 56.6	4 17

Lat.	Sunrise	Twlt. begins	Moonrise 3	Moonrise 4	Moonrise 5	Moonrise 6
N °	h m	h m	h m	h m	h m	h m
70	□	□	□	□	□	□
68	□	□	□	□	□	□
66	0 36	////	□	□	□	2 58
64	1 45	////	□	□	1 16	3 43
62	2 20	////	□	0 30	2 26	4 12
60	2 44	////	0 29	1 34	3 01	4 34
58	3 04	////	1 06	2 08	3 26	4 52
56	3 20	////	1 33	2 33	3 46	5 07
54	3 34	////	1 54	2 53	4 03	5 20
52	3 46	////	2 12	3 09	4 17	5 31
50	3 56	////	2 27	3 24	4 30	5 41
45	4 18	1 48	2 57	3 53	4 55	6 02
40	4 36	2 33	3 20	4 15	5 16	6 18
35	4 50	3 04	3 40	4 34	5 32	6 33
30	5 03	3 27	3 56	4 50	5 47	6 45
20	5 25	4 00	4 25	5 18	6 12	7 06
10	5 43	4 26	4 49	5 41	6 33	7 24
0	6 01	4 45	5 11	6 03	6 53	7 40
10	6 18	5 03	5 34	6 24	7 12	7 57
20	6 36	5 18	5 58	6 48	7 33	8 15
30	6 57	5 32	6 26	7 15	7 58	8 35
35	7 09	5 39	6 43	7 31	8 12	8 47
40	7 22	5 45	7 03	7 49	8 28	9 01
45	7 39	5 53	7 26	8 12	8 48	9 17
50	7 59	6 00	7 57	8 40	9 12	9 37
52	8 08	6 04	8 12	8 54	9 24	9 46
54	8 19	6 07	8 30	9 10	9 38	9 56
56	8 31	6 11	8 51	9 29	9 53	10 08
58	8 46	6 14	9 18	9 52	10 11	10 21
60	9 02	6 19	9 57	10 23	10 33	10 37
S						

Lat.	Sunset	Twlt. ends	Moonset 3	Moonset 4	Moonset 5	Moonset 6
N °	h m	h m	h m	h m	h m	h m
70	□	□	□	□	□	□
68	□	□	□	□	□	□
66	23 27	////	□	□	□	{0 12 / 23 32
64	22 22	////	□	□	{0 14 / 23 26	23 10
62	21 48	////	23 12	23 02	22 56	22 51
60	21 23	////	22 09	22 26	22 33	22 36
58	21 04	////	21 35	22 00	22 15	22 23
56	20 48	////	21 10	21 40	21 59	22 12
54	20 34	////	20 50	21 23	21 46	22 02
52	20 22	////	20 33	21 08	21 34	21 53
50	20 12	////	20 18	20 56	21 24	21 45
45	19 50	22 19	19 49	20 29	21 02	21 28
40	19 32	21 33	19 26	20 08	20 44	21 14
35	19 18	21 04	19 07	19 51	20 29	21 02
30	19 05	20 41	18 50	19 36	20 16	20 51
20	18 44	20 08	18 23	19 10	19 54	20 33
10	18 25	19 42	17 59	18 48	19 34	20 17
0	18 08	19 23	17 36	18 27	19 16	20 03
10	17 51	19 06	17 14	18 06	18 58	19 48
20	17 33	18 51	16 50	17 44	18 38	19 31
30	17 12	18 37	16 22	17 17	18 15	19 13
35	17 00	18 30	16 05	17 02	18 01	19 02
40	16 47	18 24	15 46	16 44	17 46	18 49
45	16 30	18 16	15 22	16 22	17 27	18 34
50	16 10	18 09	14 52	15 54	17 03	18 16
52	16 01	18 06	14 37	15 40	16 52	18 07
54	15 50	18 02	14 19	15 25	16 39	17 57
56	15 38	17 59	13 58	15 06	16 24	17 46
58	15 23	17 54	13 31	14 43	16 06	17 33
60	15 07	17 51	12 53	14 12	15 44	17 18
S						

Equation of Time (App.—Mean)

GCT	3	4	5
h	m s	m s	m s
0	− 3 51.8	− 4 03.1	− 4 14.1
6	− 3 54.7	− 4 05.9	− 4 16.8
12	− 3 57.5	− 4 08.7	− 4 19.5
18	− 4 00.3	− 4 11.4	− 4 22.2
24	− 4 03.1	− 4 14.1	− 4 24.8

GCT of Transit Meridian of Greenwich

DAY	Moon	Venus	Mars	Jupiter	Saturn
	h m	h m	h m	h m	h m
3	11 24	15 11	11 16	6 06	17 08
4	12 15	15 11	11 15	6 03	17 04
5	13 04	15 10	11 14	5 59	17 00
6	13 52	15 09	11 13	5 56	16 56

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb	Venus	Mars
°	′	′	′
0			
30	0.1	0.2	0.1
45	0.1	0.2	0.0
60	0.1	0.1	0.0
75	0.1	0.1	0.0
90	0.1	0.0	0.0

Moon's Lower Limb
Add

Alt.	3	4	5
°	′	′	′
0			
4	11.6	11.7	12.0
8	11.6	11.7	12.0
12	11.7	11.8	12.0
16	11.7	11.8	12.1
20	11.8	11.9	12.1
24	11.8	12.0	12.2
28	11.9	12.0	12.3
32	12.0	12.1	12.4
36	12.1	12.2	12.5
40	12.3	12.4	12.6
44	12.4	12.5	12.7
48	12.6	12.6	12.8
52	12.7	12.8	13.0
56	12.9	13.0	13.1
60	13.1	13.1	13.3
64	13.3	13.3	13.5
68	13.4	13.5	13.6
72	13.6	13.7	13.8
76	13.9	13.9	14.0
80	14.1	14.1	14.2
84	14.3	14.3	14.4
88	14.5	14.5	14.6
90	14.7	14.7	14.7

Add to table, back cover

Moon's Upper Limb
Subtract

Alt.	3	4	5
°	′	′	′
0			
4	17.8	17.7	17.6
8	17.8	17.7	17.6
12	17.8	17.7	17.5
16	17.7	17.6	17.5
20	17.7	17.6	17.5
24	17.6	17.5	17.4
28	17.5	17.4	17.3
32	17.4	17.3	17.2
36	17.3	17.2	17.1
40	17.2	17.1	17.0
44	17.0	17.0	16.9
48	16.9	16.8	16.7
52	16.7	16.7	16.6
56	16.5	16.5	16.4
60	16.4	16.3	16.3
64	16.2	16.1	16.1
68	16.0	16.0	15.9
72	15.8	15.8	15.7
76	15.6	15.6	15.6
80	15.4	15.4	15.4
84	15.1	15.2	15.2
88	14.9	14.9	15.0
90	14.8	14.8	14.8

Subtract from table, back cover

Independence Day 4
New Moon 4

GCT	♈ GHA	VENUS −4.0 GHA	VENUS Dec.	MARS 1.8 GHA	MARS Dec.	JUPITER −2.0 GHA	JUPITER Dec.	SATURN 1.3 GHA	SATURN Dec.	MOON GHA	code	MOON Dec.	code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
0	283 10.1	132 37.7	+12 48.1	191 40.9	+24 05.0	270 52.2	+ 3 50.7	105 15.9	+ 3 23.2	158 39.3	124	+23 00.5	− 88
1	298 12.6	147 38.2	47.2	206 41.5	05.0	285 54.4	50.8	120 18.2	23.1	173 10.7	124	22 51.7	− 88
2	313 15.0	162 38.6	46.2	221 42.1	05.1	300 56.7	50.9	135 20.5	23.1	187 42.1	125	22 42.9	− 90
3	328 17.5	177 39.1	·· 45.2	236 42.7	·· 05.1	315 58.9	·· 51.0	150 22.9	·· 23.0	202 13.6	126	·22 33.9	− 91
4	343 20.0	192 39.6	44.2	251 43.4	05.1	331 01.2	51.0	165 25.2	22.9	216 45.2	126	22 24.8	− 92
5	358 22.4	207 40.1	43.2	266 44.0	05.1	346 03.4	51.1	180 27.5	22.9	231 16.8	127	22 15.6	− 93
6	13 24.9	222 40.5	+12 42.2	281 44.6	+24 05.1	1 05.7	+ 3 51.2	195 29.8	+ 3 22.8	245 48.5	127	+22 06.3	− 94
7	28 27.4	237 41.0	41.3	296 45.2	05.1	16 08.0	51.3	210 32.2	22.7	260 20.2	128	21 56.9	− 95
8	43 29.8	252 41.5	40.3	311 45.8	05.1	31 10.2	51.3	225 34.5	22.7	274 52.0	128	21 47.4	− 95
9	58 32.3	267 42.0	·· 39.3	326 46.4	·· 05.1	46 12.5	·· 51.4	240 36.8	·· 22.6	289 23.8	129	·21 37.9	− 97
10	73 34.8	282 42.5	38.3	341 47.1	05.1	61 14.7	51.5	255 39.2	22.5	303 55.7	130	21 28.2	− 98
11	88 37.2	297 42.9	37.3	356 47.7	05.1	76 17.0	51.6	270 41.5	22.5	318 27.7	130	21 18.4	− 99
12	103 39.7	312 43.4	+12 36.3	11 48.3	+24 05.1	91 19.2	+ 3 51.7	285 43.8	+ 3 22.4	332 59.7	131	+21 08.5	− 99
13	118 42.2	327 43.9	35.3	26 48.9	05.1	106 21.5	51.7	300 46.1	22.3	347 31.8	131	20 58.6	−101
14	133 44.6	342 44.4	34.4	41 49.5	05.1	121 23.7	51.8	315 48.5	22.2	2 03.9	132	20 48.5	−102
15	148 47.1	357 44.9	·· 33.4	56 50.2	·· 05.1	136 26.0	·· 51.9	330 50.8	·· 22.2	16 36.1	132	·20 38.3	−102
16	163 49.5	12 45.4	32.4	71 50.8	05.1	151 28.2	52.0	345 53.1	22.1	31 08.3	133	20 28.1	−103
17	178 52.0	27 45.9	31.4	86 51.4	05.1	166 30.5	52.0	0 55.4	22.0	45 40.6	134	20 17.8	−105
18	193 54.5	42 46.4	+12 30.4	101 52.0	+24 05.1	181 32.7	+ 3 52.1	15 57.8	+ 3 22.0	60 13.0	134	+20 07.3	−105
19	208 56.9	57 46.9	29.4	116 52.6	05.1	196 35.0	52.2	31 00.1	21.9	74 45.4	134	19 56.8	−106
20	223 59.4	72 47.4	28.5	131 53.3	05.1	211 37.3	52.3	46 02.4	21.8	89 17.8	135	19 46.2	−107
21	239 01.9	87 47.9	·· 27.5	146 53.9	·· 05.1	226 39.5	·· 52.3	61 04.7	·· 21.8	103 50.3	136	·19 35.5	−108
22	254 04.3	102 48.4	26.5	161 54.5	05.1	241 41.8	52.4	76 07.1	21.7	118 22.9	136	19 24.7	−108
23	269 06.8	117 48.9	25.5	176 55.1	05.1	256 44.0	52.5	91 09.4	21.6	132 55.5	137	19 13.9	−110
0	284 09.3	132 49.4	+12 24.5	191 55.7	+24 05.0	271 46.3	+ 3 52.6	106 11.7	+ 3 21.6	147 28.2	137	+19 02.9	−110
1	299 11.7	147 49.9	23.5	206 56.4	05.0	286 48.5	52.6	121 14.0	21.5	162 00.9	138	18 51.9	−112
2	314 14.2	162 50.4	22.5	221 57.0	05.0	301 50.8	52.7	136 16.4	21.4	176 33.7	138	18 40.7	−112
3	329 16.6	177 50.9	·· 21.5	236 57.6	·· 05.0	316 53.1	·· 52.8	151 18.7	·· 21.4	191 06.5	139	·18 29.5	−113
4	344 19.1	192 51.4	20.6	251 58.2	05.0	331 55.3	52.9	166 21.0	21.3	205 39.4	139	18 18.2	−113
5	359 21.6	207 51.9	19.6	266 58.8	05.0	346 57.6	52.9	181 23.3	21.2	220 12.3	140	18 06.9	−115
6	14 24.0	222 52.4	+12 18.6	281 59.5	+24 05.0	1 59.8	+ 3 53.0	196 25.7	+ 3 21.1	234 45.3	140	+17 55.4	−115
7	29 26.5	237 52.9	17.6	297 00.1	05.0	17 02.1	53.1	211 28.0	21.1	249 18.3	141	17 43.9	−116
8	44 29.0	252 53.4	16.6	312 00.7	05.0	32 04.3	53.2	226 30.3	21.0	263 51.4	141	17 32.3	−117
9	59 31.4	267 53.9	·· 15.6	327 01.3	·· 05.0	47 06.6	·· 53.2	241 32.6	·· 20.9	278 24.5	142	·17 20.6	−118
10	74 33.9	282 54.5	14.6	342 01.9	05.0	62 08.9	53.3	256 34.9	20.9	292 57.7	142	17 08.8	−118
11	89 36.4	297 55.0	13.6	357 02.6	05.0	77 11.1	53.4	271 37.3	20.8	307 30.9	142	16 57.0	−119
12	104 38.8	312 55.5	+12 12.7	12 03.2	+24 05.0	92 13.4	+ 3 53.5	286 39.6	+ 3 20.7	322 04.1	144	+16 45.1	−120
13	119 41.3	327 56.0	11.7	27 03.8	05.0	107 15.6	53.5	301 41.9	20.7	336 37.5	143	16 33.1	−121
14	134 43.8	342 56.5	10.7	42 04.4	05.0	122 17.9	53.6	316 44.2	20.6	351 10.8	144	16 21.0	−121
15	149 46.2	357 57.1	·· 09.7	57 05.1	·· 04.9	137 20.2	·· 53.7	331 46.6	·· 20.5	5 44.2	145	·16 08.9	−122
16	164 48.7	12 57.6	08.7	72 05.7	04.9	152 22.4	53.7	346 48.9	20.4	20 17.7	144	15 56.7	−123
17	179 51.1	27 58.1	07.7	87 06.3	04.9	167 24.7	53.8	1 51.2	20.4	34 51.1	146	15 44.4	−124
18	194 53.6	42 58.7	+12 06.7	102 06.9	+24 04.9	182 26.9	+ 3 53.9	16 53.5	+ 3 20.3	49 24.7	145	+15 32.0	−124
19	209 56.1	57 59.2	05.7	117 07.5	04.9	197 29.2	54.0	31 55.8	20.2	63 58.2	147	15 19.6	−125
20	224 58.5	72 59.7	04.8	132 08.2	04.9	212 31.5	54.0	46 58.2	20.2	78 31.9	146	15 07.1	−126
21	240 01.0	88 00.2	·· 03.8	147 08.8	·· 04.9	227 33.7	·· 54.1	62 00.5	·· 20.1	93 05.5	147	·14 54.5	−126
22	255 03.5	103 00.8	02.8	162 09.4	04.9	242 36.0	54.2	77 02.8	20.0	107 39.2	147	14 41.9	−127
23	270 05.9	118 01.3	01.8	177 10.0	04.9	257 38.3	54.3	92 05.1	20.0	122 12.9	148	14 29.2	−128
0	285 08.4	133 01.9	+12 00.8	192 10.7	+24 04.8	272 40.5	+ 3 54.3	107 07.5	+ 3 19.9	136 46.7	148	+14 16.4	−128
1	300 10.9	148 02.4	11 59.8	207 11.3	04.8	287 42.8	54.4	122 09.8	19.8	151 20.5	149	14 03.6	−129
2	315 13.3	163 02.9	58.8	222 11.9	04.8	302 45.0	54.5	137 12.1	19.7	165 54.4	149	13 50.7	−129
3	330 15.8	178 03.5	·· 57.8	237 12.5	·· 04.8	317 47.3	·· 54.5	152 14.4	·· 19.7	180 28.3	149	·13 37.8	−130
4	345 18.3	193 04.0	56.8	252 13.1	04.8	332 49.6	54.6	167 16.7	19.6	195 02.2	149	13 24.8	−131
5	0 20.7	208 04.6	55.9	267 13.8	04.8	347 51.8	54.7	182 19.1	19.5	209 36.1	150	13 11.7	−132
6	15 23.2	223 05.1	+11 54.9	282 14.4	+24 04.8	2 54.1	+ 3 54.8	197 21.4	+ 3 19.5	224 10.1	150	+12 58.5	−132
7	30 25.6	238 05.7	53.9	297 15.0	04.7	17 56.4	54.8	212 23.7	19.4	238 44.1	151	12 45.3	−132
8	45 28.1	253 06.2	52.9	312 15.6	04.7	32 58.6	54.9	227 26.0	19.3	253 18.2	151	12 32.1	−133
9	60 30.6	268 06.8	·· 51.9	327 16.3	·· 04.7	48 00.9	·· 55.0	242 28.3	·· 19.2	267 52.3	151	·12 18.8	−134
10	75 33.0	283 07.3	50.9	342 16.9	04.7	63 03.2	55.0	257 30.7	19.2	282 26.4	151	12 05.4	−134
11	90 35.5	298 07.9	49.9	357 17.5	04.7	78 05.4	55.1	272 33.0	19.1	297 00.5	152	11 52.0	−135
12	105 38.0	313 08.4	+11 48.9	12 18.1	+24 04.7	93 07.7	+ 3 55.2	287 35.3	+ 3 19.0	311 34.7	152	+11 38.5	−136
13	120 40.4	328 09.0	47.9	27 18.8	04.6	108 10.0	55.3	302 37.6	19.0	326 08.9	152	11 24.9	−136
14	135 42.9	343 09.5	46.9	42 19.4	04.6	123 12.2	55.3	317 39.9	18.9	340 43.1	152	11 11.3	−136
15	150 45.4	358 10.1	·· 45.9	57 20.0	·· 04.6	138 14.5	·· 55.4	332 42.3	·· 18.8	355 17.3	153	·10 57.7	−137
16	165 47.8	13 10.6	45.0	72 20.6	04.6	153 16.8	55.5	347 44.6	18.8	9 51.6	153	10 44.0	−138
17	180 50.3	28 11.2	44.0	87 21.2	04.6	168 19.0	55.5	2 46.9	18.7	24 25.9	153	10 30.2	−138
18	195 52.8	43 11.8	+11 43.0	102 21.9	+24 04.6	183 21.3	+ 3 55.6	17 49.2	+ 3 18.6	39 00.2	154	+10 16.4	−138
19	210 55.2	58 12.3	42.0	117 22.5	04.5	198 23.6	55.7	32 51.5	18.5	53 34.6	153	10 02.6	−139
20	225 57.7	73 12.9	41.0	132 23.1	04.5	213 25.8	55.7	47 53.9	18.5	68 08.9	154	9 48.7	−140
21	241 00.1	88 13.5	·· 40.0	147 23.7	·· 04.5	228 28.1	·· 55.8	62 56.2	·· 18.4	82 43.3	154	· 9 34.7	−140
22	256 02.6	103 14.0	39.0	162 24.4	04.5	243 30.4	55.9	77 58.5	18.3	97 17.7	154	9 20.7	−140
23	271 05.1	118 14.6	38.0	177 25.0	04.5	258 32.6	56.0	93 00.8	18.3	111 52.1	154	9 06.7	−141
24	286 07.5	133 15.2	+11 37.0	192 25.6	+24 04.4	273 34.9	+ 3 56.0	108 03.1	+ 3 18.2	126 26.5	155	+ 8 52.6	−142
code	—	+ 5	− 10	+ 6	0	+ 22	0	+ 23	0				

GCT h	SUN GHA ° ′	SUN Dec. ° ′
0	178 53.7	+22 48.0
1	193 53.6	47.7
2	208 53.5	47.5
3	223 53.4	•• 47.3
4	238 53.3	47.0
5	253 53.2	46.8
6	268 53.1	+22 46.5
7	283 53.0	46.3
8	298 52.9	46.1
9	313 52.8	•• 45.8
10	328 52.7	45.6
11	343 52.5	45.3
12	358 52.4	+22 45.1
13	13 52.3	44.9
14	28 52.2	44.6
15	43 52.1	•• 44.4
16	58 52.0	44.1
17	73 51.9	43.9
18	88 51.8	+22 43.6
19	103 51.7	43.4
20	118 51.6	43.1
21	133 51.5	•• 42.9
22	148 51.4	42.7
23	163 51.3	42.4
0	178 51.2	+22 42.2
1	193 51.0	41.9
2	208 50.9	41.6
3	223 50.8	•• 41.4
4	238 50.7	41.1
5	253 50.6	40.9
6	268 50.5	+22 40.6
7	283 50.4	40.4
8	298 50.3	40.1
9	313 50.2	•• 39.9
10	328 50.1	39.6
11	343 50.0	39.4
12	358 49.9	+22 39.1
13	13 49.8	38.8
14	28 49.7	38.6
15	43 49.6	•• 38.3
16	58 49.5	38.1
17	73 49.4	37.8
18	88 49.3	+22 37.5
19	103 49.2	37.3
20	118 49.1	37.0
21	133 49.0	•• 36.7
22	148 48.9	36.5
23	163 48.8	36.2
0	178 48.7	+22 35.9
1	193 48.6	35.7
2	208 48.5	35.4
3	223 48.4	•• 35.1
4	238 48.3	34.9
5	253 48.2	34.6
6	268 48.0	+22 34.3
7	283 47.9	34.1
8	298 47.8	33.8
9	313 47.7	•• 33.5
10	328 47.6	33.2
11	343 47.5	33.0
12	358 47.4	+22 32.7
13	13 47.3	32.4
14	28 47.2	32.1
15	43 47.1	•• 31.9
16	58 47.0	31.6
17	73 46.9	31.3
18	88 46.9	+22 31.0
19	103 46.8	30.8
20	118 46.7	30.5
21	133 46.6	•• 30.2
22	148 46.5	29.9
23	163 46.4	29.6
24	178 46.3	+22 29.3
code	—	− 3

STARS No.	SHA ° ′	Dec. ° ′	Transit Mer. Gr. h m
1	358 31.8	+28 49.3	5 08
2	358 21.4	+58 52.7	5 09
3	349 42.5	−18 14.9	5 44
4	339 20.8	+59 58.9	6 25
5	336 01.2	−57 28.6	6 38
6	332 43.9	+89 01.9	6 51
7	328 53.6	+23 14.1	7 07
8	315 53.8	−40 29.5	7 58
9	309 47.6	+49 41.4	8 23
10	291 43.2	+16 24.9	9 35
11	281 57.1	− 8 15.2	10 14
12	281 43.8	+45 57.1	10 15
13	279 22.3	+ 6 18.6	10 24
14	279 11.9	+28 34.2	10 25
15	276 34.0	− 1 13.7	10 35
16	271 52.1	+ 7 24.1	10 54
17	264 17.4	−52 39.9	11 24
18	259 15.1	−16 38.7	11 44
19	255 49.6	−28 54.1	11 58
20	245 48.8	+ 5 21.2	12 38
21	244 25.0	+28 08.9	12 44
22	234 37.9	−59 21.2	13 23
23	223 27.3	−43 14.2	14 07
24	221 50.9	−69 31.1	14 14
25	218 42.1	− 8 26.8	14 26
26	208 33.3	+12 12.4	15 07
27	194 48.7	+62 01.1	16 02
28	183 21.2	+14 50.7	16 47
29	174 01.9	−62 50.2	17 24
30	172 53.3	−56 50.8	17 29
31	168 47.1	−59 25.8	17 45
32	167 01.2	+56 13.6	17 52
33	159 30.0	+55 10.9	18 22
34	159 20.4	−10 54.6	18 23
35	153 35.2	+49 33.5	18 46
36	149 02.6	−36 08.2	19 04
37	146 38.0	+19 26.1	19 14
38	140 55.5	−60 38.6	19 36
39	137 16.7	+74 21.4	19 51
40	126 50.2	+26 52.6	20 33
41	120 37.7	−22 29.3	20 57
42	113 23.2	−26 19.8	21 26
43	109 06.5	−68 56.8	21 43
44	103 05.7	−15 40.1	22 07
45	97 24.8	−37 04.4	22 30
46	96 49.4	+12 35.6	22 32
47	91 07.3	+51 29.6	22 55
48	84 45.2	−34 24.7	23 21
49	81 10.1	+38 44.2	23 35
50	76 55.6	−26 21.6	23 52
51	62 53.3	+ 8 44.3	0 52
52	54 31.8	−56 53.5	1 25
53	50 02.9	+45 06.2	1 43
54	34 32.6	+ 9 39.1	2 45
55	28 41.6	−47 11.6	3 08
56	16 15.0	−29 52.6	3 58
57	14 24.6	+14 56.6	4 05

Lat.	Sunrise h m	Twlt. begins h m	Moonrise 6 h m	7 h m	8 h m	9 h m
N 70	□	□	□	3 58	6 30	8 33
68	□	□	□	4 43	6 49	8 42
66	0 53	////	2 58	5 13	7 04	8 48
64	1 52	////	3 43	5 34	7 17	8 54
62	2 25	////	4 12	5 52	7 27	8 59
60	2 49	////	4 34	6 06	7 36	9 03
58	3 08	////	4 52	6 18	7 43	9 07
56	3 23	////	5 07	6 29	7 50	9 11
54	3 37	////	5 20	6 38	7 56	9 14
52	3 48	////	5 31	6 46	8 01	9 16
50	3 59	////	5 41	6 54	8 06	9 19
45	4 20	1 52	6 02	7 09	8 17	9 24
40	4 38	2 36	6 18	7 22	8 25	9 29
35	4 52	3 06	6 33	7 33	8 33	9 32
30	5 05	3 29	6 45	7 42	8 39	9 36
20	5 26	4 02	7 06	7 59	8 50	9 42
10	5 44	4 27	7 24	8 13	9 00	9 47
0	6 01	4 46	7 40	8 26	9 09	9 51
10	6 18	5 03	7 57	8 39	9 18	9 56
20	6 36	5 18	8 15	8 53	9 28	10 01
30	6 56	5 31	8 35	9 09	9 39	10 07
35	7 08	5 38	8 47	9 18	9 45	10 10
40	7 22	5 45	9 01	9 28	9 52	10 14
45	7 38	5 52	9 17	9 40	10 00	10 18
50	7 58	6 00	9 37	9 55	10 10	10 23
52	8 07	6 03	9 46	10 02	10 15	10 26
54	8 18	6 06	9 56	10 10	10 20	10 28
56	8 30	6 10	10 08	10 18	10 25	10 31
58	8 43	6 13	10 21	10 27	10 31	10 34
60	9 00	6 18	10 37	10 38	10 38	10 38
S						

Lat.	Sunset h m	Twlt. ends h m	Moonset 6 h m	7 h m	8 h m	9 h m
N 70	□	□	□	{0 49 / 23 49}	23 15	22 49
68	□	□	□	{0 03 / 23 28}	23 05	22 45
66	23 12	////	{0 12 / 23 32}	23 12	22 56	22 42
64	22 16	////	23 10	22 58	22 48	22 39
62	21 44	////	22 51	22 47	22 42	22 37
60	21 20	////	22 36	22 37	22 36	22 35
58	21 01	////	22 23	22 28	22 31	22 33
56	20 46	////	22 12	22 20	22 27	22 32
54	20 32	////	22 02	22 13	22 23	22 30
52	20 21	////	21 53	22 07	22 19	22 29
50	20 10	////	21 45	22 02	22 16	22 28
45	19 49	22 16	21 28	21 49	22 08	22 25
40	19 32	21 32	21 14	21 39	22 02	22 23
35	19 17	21 02	21 02	21 31	21 57	22 21
30	19 05	20 40	20 51	21 23	21 52	22 20
20	18 44	20 07	20 33	21 10	21 44	22 17
10	18 25	19 42	20 17	20 58	21 36	22 14
0	18 08	19 23	20 03	20 47	21 30	22 11
10	17 52	19 07	19 48	20 36	21 23	22 09
20	17 34	18 52	19 31	20 24	21 15	22 06
30	17 14	18 39	19 13	20 10	21 07	22 03
35	17 02	18 32	19 02	20 02	21 02	22 01
40	16 48	18 25	18 49	19 53	20 56	21 59
45	16 32	18 18	18 34	19 42	20 49	21 57
50	16 12	18 10	18 16	19 29	20 41	21 54
52	16 03	18 07	18 07	19 22	20 37	21 52
54	15 52	18 04	17 57	19 15	20 33	21 51
56	15 40	18 00	17 46	19 08	20 29	21 49
58	15 27	17 57	17 33	18 59	20 24	21 47
60	15 10	17 53	17 18	18 49	20 18	21 45
S						

ADDITIONAL ALTITUDE CORRECTIONS

Alt. °	Sun's Low'r Limb ′	Venus ′	Mars ′
0			
	0.1	0.2	0.1
30			
	0.1	0.2	0.0
45			
	0.1	0.1	0.0
60			
	0.1	0.1	0.0
75			
	0.1	0.0	0.0
90			

Moon's Lower Limb
Add

Alt. °	6 ′	7 ′	8 ′
0			
	12.2	12.8	13.3
4			
	12.3	12.8	13.3
8			
	12.3	12.8	13.3
12			
	12.3	12.8	13.3
16			
	12.4	12.9	13.3
20			
	12.4	12.9	13.4
24			
	12.5	13.0	13.4
28			
	12.6	13.0	13.5
32			
	12.7	13.1	13.6
36			
	12.8	13.2	13.6
40			
	12.9	13.3	13.7
44			
	13.0	13.4	13.8
48			
	13.2	13.5	13.9
52			
	13.3	13.7	14.0
56			
	13.5	13.8	14.1
60			
	13.6	13.9	14.2
64			
	13.8	14.1	14.3
68			
	14.0	14.2	14.4
72			
	14.1	14.3	14.6
76			
	14.3	14.5	14.7
80			
	14.5	14.6	14.8
84			
	14.7	14.8	14.9
88			
	14.8	14.9	15.0
90			

Add to table, back cover

Moon's Upper Limb
Subtract

Alt. °	6 ′	7 ′	8 ′
0			
	17.4	17.2	16.9
4			
	17.4	17.1	16.8
8			
	17.4	17.1	16.8
12			
	17.4	17.1	16.8
16			
	17.3	17.0	16.8
20			
	17.3	17.0	16.7
24			
	17.2	16.9	16.7
28			
	17.1	16.9	16.6
32			
	17.0	16.8	16.6
36			
	16.9	16.7	16.5
40			
	16.8	16.6	16.4
44			
	16.6	16.5	16.3
48			
	16.5	16.4	16.2
52			
	16.4	16.2	16.1
56			
	16.2	16.1	16.0
60			
	16.1	16.0	15.9
64			
	15.9	15.8	15.8
68			
	15.7	15.7	15.7
72			
	15.6	15.6	15.6
76			
	15.4	15.4	15.4
80			
	15.2	15.3	15.3
84			
	15.0	15.1	15.2
88			
	14.9	15.0	15.1
90			

Subtract from table, back cover

Equation of Time (App.—Mean)

GCT h	6 m s	7 m s	8 m s
0	− 4 24.8	− 4 35.2	− 4 45.2
6	− 4 27.4	− 4 37.7	− 4 47.6
12	− 4 30.0	− 4 40.2	− 4 50.0
18	− 4 32.6	− 4 42.7	− 4 52.4
24	− 4 35.2	− 4 45.2	− 4 54.8

GCT of Transit Meridian of Greenwich

DAY	Moon h m	Venus h m	Mars h m	Jupiter h m	Saturn h m
6	13 52	15 09	11 13	5 56	16 56
7	14 36	15 08	11 12	5 52	16 53
8	15 19	15 07	11 11	5 48	16 49
9	16 01	15 06	11 10	5 45	16 45

833190°—50——9

GCT	♈ GHA	VENUS −4.1 GHA	VENUS Dec.	MARS 1.8 GHA	MARS Dec.	JUPITER −2.1 GHA	JUPITER Dec.	SATURN 1.3 GHA	SATURN Dec.	MOON GHA	code	MOON Dec.	code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
0	286 07.5	133 15.2	+11 37.0	192 25.6	+24 04.4	273 34.9	+ 3 56.0	108 03.1	+ 3 18.2	126 26.5	155	+ 8 52.6	−142
1	301 10.0	148 15.8	36.0	207 26.2	04.4	288 37.2	56.1	123 05.4	18.1	141 01.0	155	8 38.4	−142
2	316 12.5	163 16.3	35.0	222 26.9	04.4	303 39.5	56.2	138 07.8	18.0	155 35.5	154	8 24.2	−142
3	331 14.9	178 16.9	·· 34.1	237 27.5	·· 04.4	318 41.7	·· 56.2	153 10.1	·· 18.0	170 09.9	155	· 8 10.0	−143
4	346 17.4	193 17.5	33.1	252 28.1	04.3	333 44.0	56.3	168 12.4	17.9	184 44.4	155	7 55.7	−143
5	1 19.9	208 18.1	32.1	267 28.7	04.3	348 46.3	56.4	183 14.7	17.8	199 18.9	155	7 41.4	−143
6	16 22.3	223 18.7	+11 31.1	282 29.4	+24 04.3	3 48.5	+ 3 56.4	198 17.0	+ 3 17.7	213 53.4	155	+ 7 27.1	−144
7	31 24.8	238 19.2	30.1	297 30.0	04.3	18 50.8	56.5	213 19.3	17.7	228 27.9	156	7 12.7	−145
8	46 27.3	253 19.8	29.1	312 30.6	04.2	33 53.1	56.6	228 21.7	17.6	243 02.5	155	6 58.2	−144
9	61 29.7	268 20.4	·· 28.1	327 31.2	·· 04.2	48 55.4	·· 56.6	243 24.0	·· 17.5	257 37.0	155	· 6 43.8	−145
10	76 32.2	283 21.0	27.1	342 31.9	04.2	63 57.6	56.7	258 26.3	17.5	272 11.5	156	6 29.3	−146
11	91 34.6	298 21.6	26.1	357 32.5	04.2	78 59.9	56.8	273 28.6	17.4	286 46.1	155	6 14.7	−146
12	106 37.1	313 22.2	+11 25.1	12 33.1	+24 04.1	94 02.2	+ 3 56.9	288 30.9	+ 3 17.3	301 20.6	156	+ 6 00.1	−146
13	121 39.6	328 22.8	24.1	27 33.7	04.1	109 04.4	56.9	303 33.2	17.2	315 55.2	155	5 45.5	−147
14	136 42.0	343 23.4	23.1	42 34.4	04.1	124 06.7	57.0	318 35.6	17.2	330 29.7	156	5 30.8	−146
15	151 44.5	358 24.0	·· 22.1	57 35.0	·· 04.1	139 09.0	·· 57.1	333 37.9	·· 17.1	345 04.3	155	· 5 16.2	−148
16	166 47.0	13 24.6	21.2	72 35.6	04.0	154 11.3	57.1	348 40.2	17.0	359 38.8	156	5 01.4	−147
17	181 49.4	28 25.1	20.2	87 36.2	04.0	169 13.5	57.2	3 42.5	17.0	14 13.4	155	4 46.7	−148
18	196 51.9	43 25.7	+11 19.2	102 36.9	+24 04.0	184 15.8	+ 3 57.3	18 44.8	+ 3 16.9	28 47.9	155	+ 4 31.9	−148
19	211 54.4	58 26.4	18.2	117 37.5	04.0	199 18.1	57.3	33 47.1	16.8	43 22.4	156	4 17.1	−149
20	226 56.8	73 27.0	17.2	132 38.1	03.9	214 20.4	57.4	48 49.5	16.7	57 57.0	155	4 02.2	−149
21	241 59.3	88 27.6	·· 16.2	147 38.8	·· 03.9	229 22.6	·· 57.5	63 51.8	·· 16.7	72 31.5	155	· 3 47.3	−149
22	257 01.7	103 28.2	15.2	162 39.4	03.9	244 24.9	57.5	78 54.1	16.6	87 06.0	155	3 32.4	−149
23	272 04.2	118 28.8	14.2	177 40.0	03.8	259 27.2	57.6	93 56.4	16.5	101 40.5	155	3 17.5	−150
0	287 06.7	133 29.4	+11 13.2	192 40.6	+24 03.8	274 29.5	+ 3 57.7	108 58.7	+ 3 16.4	116 15.0	155	+ 3 02.5	−149
1	302 09.1	148 30.0	12.2	207 41.3	03.8	289 31.7	57.7	124 01.0	16.4	130 49.5	155	2 47.6	−151
2	317 11.6	163 30.6	11.2	222 41.9	03.8	304 34.0	57.8	139 03.3	16.3	145 24.0	154	2 32.5	−150
3	332 14.1	178 31.2	·· 10.2	237 42.5	·· 03.7	319 36.3	·· 57.9	154 05.7	·· 16.2	159 58.4	155	· 2 17.5	−150
4	347 16.5	193 31.8	09.2	252 43.1	03.7	334 38.6	57.9	169 08.0	16.2	174 32.9	154	2 02.5	−151
5	2 19.0	208 32.4	08.2	267 43.8	03.7	349 40.9	58.0	184 10.3	16.1	189 07.3	154	1 47.4	−151
6	17 21.5	223 33.1	+11 07.2	282 44.4	+24 03.6	4 43.1	+ 3 58.1	199 12.6	+ 3 16.0	203 41.7	154	+ 1 32.3	−151
7	32 23.9	238 33.7	06.3	297 45.0	03.6	19 45.4	58.1	214 14.9	15.9	218 16.1	153	1 17.2	−152
8	47 26.4	253 34.3	05.3	312 45.7	03.6	34 47.7	58.2	229 17.2	15.9	232 50.4	154	1 02.0	−151
9	62 28.9	268 34.9	·· 04.3	327 46.3	·· 03.5	49 50.0	·· 58.3	244 19.5	·· 15.8	247 24.8	153	· 0 46.9	−152
10	77 31.3	283 35.5	03.3	342 46.9	03.5	64 52.2	58.3	259 21.9	15.7	261 59.1	153	0 31.7	−152
11	92 33.8	298 36.2	02.3	357 47.5	03.5	79 54.5	58.4	274 24.2	15.6	276 33.4	152	0 16.5	−152
12	107 36.2	313 36.8	+11 01.3	12 48.2	+24 03.4	94 56.8	+ 3 58.4	289 26.5	+ 3 15.6	291 07.6	153	+ 0 01.3	−152
13	122 38.7	328 37.4	11 00.3	27 48.8	03.4	109 59.1	58.5	304 28.8	15.5	305 41.9	152	− 0 13.9	−153
14	137 41.2	343 38.1	10 59.3	42 49.4	03.4	125 01.4	58.6	319 31.1	15.4	320 16.1	152	0 29.2	−152
15	152 43.6	358 38.7	·· 58.3	57 50.0	·· 03.3	140 03.6	·· 58.6	334 33.4	·· 15.3	334 50.3	151	· 0 44.4	−153
16	167 46.1	13 39.3	57.3	72 50.7	03.3	155 05.9	58.7	349 35.7	15.3	349 24.4	152	0 59.7	−153
17	182 48.6	28 40.0	56.3	87 51.3	03.2	170 08.2	58.8	4 38.0	15.2	3 58.6	150	1 15.0	−153
18	197 51.0	43 40.6	+10 55.3	102 51.9	+24 03.2	185 10.5	+ 3 58.8	19 40.4	+ 3 15.1	18 32.6	151	− 1 30.3	−152
19	212 53.5	58 41.2	54.3	117 52.6	03.2	200 12.8	58.9	34 42.7	15.0	33 06.7	150	1 45.5	−154
20	227 56.0	73 41.9	53.3	132 53.2	03.1	215 15.0	59.0	49 45.0	15.0	47 40.7	150	2 00.9	−153
21	242 58.4	88 42.5	·· 52.3	147 53.8	·· 03.1	230 17.3	·· 59.0	64 47.3	·· 14.9	62 14.7	149	· 2 16.2	−153
22	258 00.9	103 43.2	51.3	162 54.5	03.1	245 19.6	59.1	79 49.6	14.8	76 48.6	149	2 31.5	−153
23	273 03.3	118 43.8	50.3	177 55.1	03.0	260 21.9	59.2	94 51.9	14.8	91 22.5	149	2 46.8	−153
0	288 05.8	133 44.5	+10 49.4	192 55.7	+24 03.0	275 24.2	+ 3 59.2	109 54.2	+ 3 14.7	105 56.4	148	− 3 02.1	−154
1	303 08.3	148 45.1	48.4	207 56.3	02.9	290 26.5	59.3	124 56.5	14.6	120 30.2	147	3 17.5	−153
2	318 10.7	163 45.7	47.4	222 57.0	02.9	305 28.7	59.3	139 58.8	14.5	135 03.9	147	3 32.8	−153
3	333 13.2	178 46.4	·· 46.4	237 57.6	·· 02.9	320 31.0	·· 59.4	155 01.2	·· 14.5	149 37.6	147	· 3 48.1	−154
4	348 15.7	193 47.0	45.4	252 58.2	02.8	335 33.3	59.5	170 03.5	14.4	164 11.3	146	4 03.5	−153
5	3 18.1	208 47.7	44.4	267 58.9	02.8	350 35.6	59.5	185 05.8	14.3	178 44.9	146	4 18.8	−153
6	18 20.6	223 48.4	+10 43.4	282 59.5	+24 02.8	5 37.9	+ 3 59.6	200 08.1	+ 3 14.2	193 18.5	145	− 4 34.1	−154
7	33 23.1	238 49.0	42.4	298 00.1	02.7	20 40.2	59.7	215 10.4	14.2	207 52.0	145	4 49.5	−153
8	48 25.5	253 49.7	41.4	313 00.7	02.7	35 42.5	59.7	230 12.7	14.1	222 25.5	144	5 04.8	−153
9	63 28.0	268 50.3	·· 40.4	328 01.4	·· 02.6	50 44.7	·· 59.8	245 15.0	·· 14.0	236 58.9	144	· 5 20.1	−153
10	78 30.5	283 51.0	39.4	343 02.0	02.6	65 47.0	59.8	260 17.3	13.9	251 32.3	143	5 35.4	−153
11	93 32.9	298 51.7	38.4	358 02.6	02.5	80 49.3	3 59.9	275 19.6	13.9	266 05.6	142	5 50.7	−153
12	108 35.4	313 52.3	+10 37.4	13 03.3	+24 02.5	95 51.6	+ 4 00.0	290 22.0	+ 3 13.8	280 38.8	142	− 6 06.0	−153
13	123 37.8	328 53.0	36.4	28 03.9	02.5	110 53.9	00.0	305 24.3	13.7	295 12.0	141	6 21.3	−153
14	138 40.3	343 53.7	35.4	43 04.5	02.4	125 56.2	00.1	320 26.6	13.6	309 45.1	140	6 36.6	−153
15	153 42.8	358 54.3	·· 34.4	58 05.2	·· 02.4	140 58.5	·· 00.2	335 28.9	·· 13.6	324 18.1	140	· 6 51.9	−152
16	168 45.2	13 55.0	33.4	73 05.8	02.3	156 00.7	00.2	350 31.2	13.5	338 51.1	140	7 07.1	−153
17	183 47.7	28 55.7	32.4	88 06.4	02.3	171 03.0	00.3	5 33.5	13.4	353 24.1	138	7 22.4	−152
18	198 50.2	43 56.3	+10 31.5	103 07.1	+24 02.2	186 05.3	+ 4 00.3	20 35.8	+ 3 13.3	7 56.9	138	− 7 37.6	−152
19	213 52.6	58 57.0	30.5	118 07.7	02.2	201 07.6	00.4	35 38.1	13.3	22 29.7	137	7 52.8	−152
20	228 55.1	73 57.7	29.5	133 08.3	02.1	216 09.9	00.5	50 40.4	13.2	37 02.4	137	8 08.0	−152
21	243 57.6	88 58.4	·· 28.5	148 08.9	·· 02.1	231 12.2	·· 00.5	65 42.7	·· 13.1	51 35.1	135	· 8 23.2	−151
22	259 00.0	103 59.1	27.5	163 09.6	02.1	246 14.5	00.6	80 45.1	13.0	66 07.6	135	8 38.3	−152
23	274 02.5	118 59.7	26.5	178 10.2	02.0	261 16.8	00.6	95 47.4	13.0	80 40.1	134	8 53.5	−151
24	289 05.0	134 00.4	+10 25.5	193 10.8	+24 02.0	276 19.1	+ 4 00.7	110 49.7	+ 3 12.9	95 12.5	134	− 9 08.6	−151
code	−	+ 6	− 10	+ 6	0	+ 23	+ 1	+ 23	− 1				

GCT h	SUN GHA ° ′	SUN Dec. ° ′
0	178 46.3	+22 29.3
1	193 46.2	29.1
2	208 46.1	28.8
3	223 46.0 ••	28.5
4	238 45.9	28.2
5	253 45.8	27.9
6	268 45.7	+22 27.6
7	283 45.6	27.3
8	298 45.5	27.1
9	313 45.4 ••	26.8
10	328 45.3	26.5
11	343 45.2	26.2
12	358 45.1	+22 25.9
13	13 45.0	25.6
14	28 44.9	25.3
15	43 44.8 ••	25.0
16	58 44.7	24.7
17	73 44.6	24.4
18	88 44.5	+22 24.1
19	103 44.4	23.8
20	118 44.3	23.6
21	133 44.2 ••	23.3
22	148 44.2	23.0
23	163 44.1	22.7
0	178 44.0	+22 22.4
1	193 43.9	22.1
2	208 43.8	21.8
3	223 43.7 ••	21.5
4	238 43.6	21.2
5	253 43.5	20.9
6	268 43.4	+22 20.6
7	283 43.3	20.3
8	298 43.2	19.9
9	313 43.1 ••	19.6
10	328 43.0	19.3
11	343 42.9	19.0
12	358 42.9	+22 18.7
13	13 42.8	18.4
14	28 42.7	18.1
15	43 42.6 ••	17.8
16	58 42.5	17.5
17	73 42.4	17.2
18	88 42.3	+22 16.9
19	103 42.2	16.6
20	118 42.1	16.2
21	133 42.0 ••	15.9
22	148 42.0	15.6
23	163 41.9	15.3
0	178 41.8	+22 15.0
1	193 41.7	14.7
2	208 41.6	14.4
3	223 41.5 ••	14.0
4	238 41.4	13.7
5	253 41.3	13.4
6	268 41.2	+22 13.1
7	283 41.2	12.8
8	298 41.1	12.4
9	313 41.0 ••	12.1
10	328 40.9	11.8
11	343 40.8	11.5
12	358 40.7	+22 11.2
13	13 40.6	10.8
14	28 40.6	10.5
15	43 40.5 ••	10.2
16	58 40.4	09.9
17	73 40.3	09.5
18	88 40.2	+22 09.2
19	103 40.1	08.9
20	118 40.0	08.6
21	133 40.0 ••	08.2
22	148 39.9	07.9
23	163 39.8	07.6
24	178 39.7	+22 07.2
code	—	− 3

STARS No.	SHA ° ′	Dec. ° ′	Transit Mer. Gr. h m
1	358 31.7	+28 49.3	4 57
2	358 21.3	+58 52.7	4 57
3	349 42.5	−18 14.9	5 32
4	339 20.8	+59 58.9	6 13
5	336 01.2	−57 28.6	6 26
6	332 42.9	+89 01.9	6 40
7	328 53.5	+23 14.1	6 55
8	315 53.7	−40 29.5	7 47
9	309 47.5	+49 41.4	8 11
10	291 43.2	+16 24.9	9 23
11	281 57.1	− 8 15.2	10 02
12	281 43.8	+45 57.1	10 03
13	279 22.3	+ 6 18.6	10 12
14	279 11.9	+28 34.2	10 13
15	276 33.9	− 1 13.7	10 24
16	271 52.0	+ 7 24.2	10 42
17	264 17.4	−52 39.9	11 13
18	259 15.1	−16 38.7	11 33
19	255 49.5	−28 54.1	11 46
20	245 48.8	+ 5 21.2	12 26
21	244 25.0	+28 08.9	12 32
22	234 37.9	−59 21.2	13 11
23	223 27.3	−43 14.2	13 55
24	221 50.9	−69 31.1	14 02
25	218 42.1	− 8 26.8	14 14
26	208 33.3	+12 12.4	14 55
27	194 48.7	+62 01.1	15 50
28	183 21.2	+14 50.7	16 35
29	174 02.0	−62 50.2	17 13
30	172 53.3	−56 50.8	17 17
31	168 47.1	−59 25.8	17 34
32	167 01.2	+56 13.6	17 41
33	159 30.1	+55 10.9	18 11
34	159 20.4	−10 54.6	18 11
35	153 35.2	+49 33.5	18 34
36	149 02.6	−36 08.2	18 52
37	146 38.0	+19 26.1	19 02
38	140 55.5	−60 38.6	19 25
39	137 16.7	+74 21.4	19 39
40	126 50.2	+26 52.6	20 21
41	120 37.7	−22 29.3	20 46
42	113 23.2	−26 19.8	21 15
43	109 06.5	−68 56.8	21 32
44	103 05.7	−15 40.1	21 56
45	97 24.8	−37 04.4	22 18
46	96 49.4	+12 35.6	22 21
47	91 07.3	+51 29.6	22 43
48	84 45.2	−34 24.7	23 09
49	81 10.1	+38 44.2	23 23
50	76 55.6	−26 21.6	23 40
51	62 53.3	+ 8 44.3	0 40
52	54 31.8	−56 53.5	1 13
53	50 02.9	+45 06.2	1 31
54	34 32.6	+ 9 39.1	2 33
55	28 41.6	−47 11.6	2 56
56	16 15.0	−29 52.6	3 46
57	14 24.6	+14 56.6	3 53

Lat.	Sunrise	Twlt. begins	Moonrise 9	Moonrise 10	Moonrise 11	Moonrise 12
N °	h m	h m	h m	h m	h m	h m
70	▭	▭	8 33	10 30	12 30	14 43
68	▭	▭	8 42	10 30	12 22	14 24
66	1 08	////	8 48	10 31	12 15	14 09
64	1 59	////	8 54	10 31	12 10	13 56
62	2 30	////	8 59	10 31	12 05	13 46
60	2 53	////	9 03	10 31	12 01	13 37
58	3 11	////	9 07	10 31	11 58	13 29
56	3 27	////	9 11	10 32	11 55	13 22
54	3 40	////	9 14	10 32	11 52	13 16
52	3 51	////	9 16	10 32	11 49	13 10
50	4 01	////	9 19	10 32	11 47	13 05
45	4 22	1 56	9 24	10 32	11 42	12 55
40	4 39	2 39	9 29	10 32	11 38	12 46
35	4 54	3 08	9 32	10 32	11 34	12 39
30	5 06	3 31	9 36	10 33	11 31	12 32
20	5 27	4 04	9 42	10 33	11 26	12 21
10	5 45	4 28	9 47	10 33	11 21	12 11
0	6 02	4 46	9 51	10 34	11 17	12 02
10	6 18	5 03	9 56	10 34	11 12	11 53
20	6 36	5 18	10 01	10 34	11 08	11 44
30	6 56	5 31	10 07	10 34	11 03	11 33
35	7 07	5 38	10 10	10 35	11 00	11 27
40	7 21	5 44	10 14	10 35	10 57	11 20
45	7 37	5 51	10 18	10 35	10 53	11 12
50	7 56	5 59	10 23	10 36	10 48	11 03
52	8 05	6 02	10 26	10 36	10 46	10 58
54	8 15	6 05	10 28	10 36	10 44	10 53
56	8 27	6 08	10 31	10 36	10 42	10 48
58	8 41	6 12	10 34	10 36	10 39	10 42
60	8 56	6 16	10 38	10 37	10 36	10 36
S						

Lat.	Sunset	Twlt. ends	Moonset 9	Moonset 10	Moonset 11	Moonset 12
N °	h m	h m	h m	h m	h m	h m
70	▭	▭	22 49	22 23	21 55	21 18
68	▭	▭	22 45	22 26	22 06	21 40
66	22 58	////	22 42	22 29	22 14	21 57
64	22 09	////	22 39	22 31	22 21	22 11
62	21 39	////	22 37	22 33	22 28	22 23
60	21 16	////	22 35	22 34	22 33	22 33
58	20 58	////	22 33	22 36	22 38	22 42
56	20 43	////	22 32	22 37	22 43	22 50
54	20 30	////	22 30	22 38	22 47	22 57
52	20 18	////	22 29	22 39	22 50	23 03
50	20 08	////	22 28	22 40	22 53	23 09
45	19 47	22 12	22 25	22 43	23 01	23 21
40	19 31	21 30	22 23	22 44	23 07	23 32
35	19 16	21 01	22 21	22 46	23 12	23 41
30	19 04	20 39	22 20	22 47	23 16	23 48
20	18 43	20 06	22 17	22 50	23 24	24 02
10	18 25	19 42	22 14	22 52	23 31	24 14
0	18 09	19 23	22 11	22 54	23 38	24 25
10	17 53	19 08	22 09	22 56	23 45	24 37
20	17 35	18 53	22 06	22 58	23 52	24 49
30	17 15	18 40	22 03	23 00	24 00	0 00
35	17 03	18 33	22 01	23 02	24 05	0 05
40	16 50	18 27	21 59	23 03	24 10	0 10
45	16 34	18 20	21 57	23 05	24 16	0 16
50	16 15	18 13	21 54	23 07	24 24	0 24
52	16 06	18 10	21 52	23 08	24 27	0 27
54	15 55	18 06	21 51	23 09	24 31	0 31
56	15 44	18 03	21 49	23 11	24 35	0 35
58	15 30	17 59	21 47	23 12	24 40	0 40
60	15 15	17 56	21 45	23 14	24 46	0 46
S						

GCT h	Equation of Time (App.—Mean) 9 m s	10 m s	11 m s
0	− 4 54.8	− 5 04.0	− 5 12.7
6	− 4 57.1	− 5 06.2	− 5 14.8
12	− 4 59.4	− 5 08.4	− 5 16.9
18	− 5 01.7	− 5 10.6	− 5 19.0
24	− 5 04.0	− 5 12.7	− 5 21.0

GCT of Transit Meridian of Greenwich

DAY	Moon h m	Venus h m	Mars h m	Jupiter h m	Saturn h m
9	16 01	15 06	11 10	5 45	16 45
10	16 44	15 05	11 09	5 41	16 42
11	17 27	15 04	11 08	5 38	16 38
12	18 14	15 03	11 07	5 34	16 34

ADDITIONAL ALTITUDE CORRECTIONS

Alt. °	Sun's Low'r Limb ′	Venus ′	Mars ′
0	0.1	0.2	0.1
30	0.1	0.2	0.0
45	0.1	0.2	0.0
60	0.1	0.1	0.0
75	0.1	0.0	0.0
90			

Moon's Lower Limb

Add

Alt. °	9 ′	10 ′	11 ′
0	14.0	14.8	15.7
4	14.0	14.8	15.7
8	14.0	14.8	15.7
12	14.1	14.8	15.7
16	14.1	14.8	15.7
20	14.1	14.8	15.7
24	14.1	14.8	15.7
28	14.2	14.9	15.7
32	14.2	14.9	15.7
36	14.3	14.9	15.7
40	14.3	14.9	15.7
44	14.4	15.0	15.6
48	14.5	15.0	15.6
52	14.5	15.0	15.6
56	14.6	15.1	15.6
60	14.7	15.1	15.6
64	14.7	15.1	15.6
68	14.8	15.2	15.6
72	14.9	15.2	15.6
76	15.0	15.3	15.6
80	15.1	15.3	15.6
84	15.1	15.3	15.6
88	15.2	15.4	15.6
90			

Add to table, back cover

Moon's Upper Limb

Subtract

Alt. °	9 ′	10 ′	11 ′
0	16.4	16.0	15.5
4	16.4	16.0	15.5
8	16.4	16.0	15.5
12	16.4	16.0	15.5
16	16.4	16.0	15.5
20	16.3	15.9	15.5
24	16.3	15.9	15.5
28	16.3	15.9	15.5
32	16.2	15.9	15.5
36	16.2	15.9	15.5
40	16.1	15.8	15.5
44	16.1	15.8	15.5
48	16.0	15.8	15.5
52	15.9	15.7	15.5
56	15.9	15.7	15.5
60	15.8	15.7	15.5
64	15.7	15.6	15.5
68	15.6	15.6	15.5
72	15.6	15.6	15.6
76	15.5	15.5	15.6
80	15.4	15.5	15.6
84	15.3	15.4	15.6
88	15.2	15.4	15.6
90			

Subtract from table, back cover

G C T	♈ GHA	VENUS −4.1 GHA	Dec.	MARS 1.8 GHA	Dec.	JUPITER −2.1 GHA	Dec.	SATURN 1.3 GHA	Dec.	MOON GHA	code	Dec.	code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
0	289 05.0	134 00.4	+10 25.5	193 10.8	+24 02.0	276 19.1	+ 4 00.7	110 49.7	+ 3 12.9	95 12.5	134	− 9 08.6	−151
1	304 07.4	149 01.1	24.5	208 11.5	01.9	291 21.3	00.8	125 52.0	12.8	109 44.9	132	9 23.7	−150
2	319 09.9	164 01.8	23.5	223 12.1	01.9	306 23.6	00.8	140 54.3	12.7	124 17.1	132	9 38.7	−151
3	334 12.3	179 02.5	·· 22.5	238 12.7	·· 01.8	321 25.9	·· 00.9	155 56.6	·· 12.7	138 49.3	131	· 9 53.8	−150
4	349 14.8	194 03.2	21.5	253 13.4	01.8	336 28.2	01.0	170 58.9	12.6	153 21.4	130	10 08.8	−150
5	4 17.3	209 03.9	20.5	268 14.0	01.7	351 30.5	01.0	186 01.2	12.5	167 53.4	130	10 23.8	−149
6	19 19.7	224 04.6	+10 19.5	283 14.6	+24 01.7	6 32.8	+ 4 01.1	201 03.5	+ 3 12.4	182 25.4	128	−10 38.7	−149
7	34 22.2	239 05.3	18.5	298 15.3	01.6	21 35.1	01.1	216 05.8	12.3	196 57.2	128	10 53.6	−149
8	49 24.7	254 05.9	17.5	313 15.9	01.6	36 37.4	01.2	231 08.1	12.3	211 29.0	126	11 08.5	−149
9	64 27.1	269 06.6	·· 16.5	328 16.5	·· 01.5	51 39.7	·· 01.3	246 10.4	·· 12.2	226 00.6	126	·11 23.4	−148
10	79 29.6	284 07.3	15.5	343 17.2	01.5	66 42.0	01.3	261 12.7	12.1	240 32.2	125	11 38.2	−148
11	94 32.1	299 08.0	14.5	358 17.8	01.4	81 44.3	01.4	276 15.1	12.0	255 03.7	124	11 53.0	−147
12	109 34.5	314 08.8	+10 13.6	13 18.4	+24 01.4	96 46.6	+ 4 01.4	291 17.4	+ 3 12.0	269 35.1	123	−12 07.7	−147
13	124 37.0	329 09.5	12.6	28 19.1	01.3	111 48.8	01.5	306 19.7	11.9	284 06.4	122	12 22.4	−147
14	139 39.5	344 10.2	11.6	43 19.7	01.3	126 51.1	01.5	321 22.0	11.8	298 37.6	121	12 37.1	−146
15	154 41.9	359 10.9	·· 10.6	58 20.3	·· 01.2	141 53.4	·· 01.6	336 24.3	·· 11.7	313 08.7	120	·12 51.7	−146
16	169 44.4	14 11.6	09.6	73 21.0	01.2	156 55.7	01.7	351 26.6	11.7	327 39.7	119	13 06.3	−145
17	184 46.8	29 12.3	08.6	88 21.6	01.1	171 58.0	01.7	6 28.9	11.6	342 10.6	118	13 20.8	−145
18	199 49.3	44 13.0	+10 07.6	103 22.2	+24 01.1	187 00.3	+ 4 01.8	21 31.2	+ 3 11.5	356 41.4	117	−13 35.3	−144
19	214 51.8	59 13.7	06.6	118 22.9	01.0	202 02.6	01.8	36 33.5	11.4	11 12.1	116	13 49.7	−144
20	229 54.2	74 14.4	05.6	133 23.5	00.9	217 04.9	01.9	51 35.8	11.4	25 42.7	115	14 04.1	−143
21	244 56.7	89 15.2	·· 04.6	148 24.1	·· 00.9	232 07.2	·· 02.0	66 38.1	·· 11.3	40 13.2	113	·14 18.4	−143
22	259 59.2	104 15.9	03.6	163 24.8	00.8	247 09.5	02.0	81 40.4	11.2	54 43.5	113	14 32.7	−142
23	275 01.6	119 16.6	02.6	178 25.4	00.8	262 11.8	02.1	96 42.7	11.1	69 13.8	112	14 46.9	−141
0	290 04.1	134 17.3	+10 01.6	193 26.0	+24 00.7	277 14.1	+ 4 02.1	111 45.0	+ 3 11.0	83 44.0	110	−15 01.0	−141
1	305 06.6	149 18.0	10 00.6	208 26.7	00.7	292 16.4	02.2	126 47.3	11.0	98 14.0	110	15 15.1	−141
2	320 09.0	164 18.8	9 59.6	223 27.3	00.6	307 18.7	02.2	141 49.6	10.9	112 44.0	108	15 29.2	−139
3	335 11.5	179 19.5	·· 58.6	238 27.9	·· 00.6	322 21.0	·· 02.3	156 51.9	·· 10.8	127 13.8	107	·15 43.1	−140
4	350 13.9	194 20.2	57.6	253 28.6	00.5	337 23.3	02.4	171 54.3	10.7	141 43.5	106	15 57.1	−138
5	5 16.4	209 21.0	56.7	268 29.2	00.4	352 25.6	02.4	186 56.6	10.7	156 13.1	104	16 10.9	−138
6	20 18.9	224 21.7	+ 9 55.7	283 29.9	+24 00.4	7 27.9	+ 4 02.5	201 58.9	+ 3 10.6	170 42.5	104	−16 24.7	−137
7	35 21.3	239 22.4	54.7	298 30.5	00.3	22 30.2	02.5	217 01.2	10.5	185 11.9	102	16 38.4	−136
8	50 23.8	254 23.2	53.7	313 31.1	00.3	37 32.5	02.6	232 03.5	10.4	199 41.1	101	16 52.0	−136
9	65 26.3	269 23.9	·· 52.7	328 31.8	·· 00.2	52 34.8	·· 02.6	247 05.8	·· 10.4	214 10.2	100	·17 05.6	−135
10	80 28.7	284 24.6	51.7	343 32.4	00.2	67 37.1	02.7	262 08.1	10.3	228 39.2	99	17 19.1	−134
11	95 31.2	299 25.4	50.7	358 33.0	00.1	82 39.4	02.8	277 10.4	10.2	243 08.1	97	17 32.5	−134
12	110 33.7	314 26.1	+ 9 49.7	13 33.7	+24 00.0	97 41.7	+ 4 02.8	292 12.7	+ 3 10.1	257 36.8	97	−17 45.9	−132
13	125 36.1	329 26.9	48.7	28 34.3	24 00.0	112 44.0	02.9	307 15.0	10.0	272 05.5	95	17 59.1	−132
14	140 38.6	344 27.6	47.7	43 34.9	23 59.9	127 46.3	02.9	322 17.3	10.0	286 34.0	93	18 12.3	−131
15	155 41.1	359 28.4	·· 46.7	58 35.6	·· 59.9	142 48.6	·· 03.0	337 19.6	·· 09.9	301 02.3	93	·18 25.4	−130
16	170 43.5	14 29.1	45.7	73 36.2	59.8	157 50.9	03.0	352 21.9	09.8	315 30.6	91	18 38.4	−129
17	185 46.0	29 29.9	44.7	88 36.8	59.7	172 53.2	03.1	7 24.2	09.7	329 58.7	89	18 51.3	−128
18	200 48.4	44 30.6	+ 9 43.7	103 37.5	+23 59.7	187 55.5	+ 4 03.1	22 26.5	+ 3 09.7	344 26.6	89	−19 04.1	−128
19	215 50.9	59 31.4	42.7	118 38.1	59.6	202 57.8	03.2	37 28.8	09.6	358 54.5	87	19 16.9	−126
20	230 53.4	74 32.1	41.8	133 38.8	59.5	218 00.1	03.3	52 31.1	09.5	13 22.2	86	19 29.5	−126
21	245 55.8	89 32.9	·· 40.8	148 39.4	·· 59.5	233 02.4	·· 03.3	67 33.4	·· 09.4	27 49.8	84	·19 42.1	−124
22	260 58.3	104 33.6	39.8	163 40.0	59.4	248 04.7	03.4	82 35.7	09.3	42 17.2	83	19 54.5	−124
23	276 00.8	119 34.4	38.8	178 40.7	59.4	263 07.0	03.4	97 38.0	09.3	56 44.5	82	20 06.9	−122
0	291 03.2	134 35.2	+ 9 37.8	193 41.3	+23 59.3	278 09.3	+ 4 03.5	112 40.3	+ 3 09.2	71 11.7	80	−20 19.1	−122
1	306 05.7	149 35.9	36.8	208 41.9	59.2	293 11.6	03.5	127 42.6	09.1	85 38.7	79	20 31.3	−120
2	321 08.2	164 36.7	35.8	223 42.6	59.2	308 13.9	03.6	142 44.9	09.0	100 05.6	78	20 43.3	−119
3	336 10.6	179 37.5	·· 34.8	238 43.2	·· 59.1	323 16.2	·· 03.6	157 47.2	·· 09.0	114 32.4	76	·20 55.2	−119
4	351 13.1	194 38.2	33.8	253 43.9	59.0	338 18.5	03.7	172 49.5	08.9	128 59.0	75	21 07.1	−117
5	6 15.6	209 39.0	32.8	268 44.5	59.0	353 20.8	03.8	187 51.8	08.8	143 25.5	74	21 18.8	−116
6	21 18.0	224 39.8	+ 9 31.8	283 45.1	+23 58.9	8 23.1	+ 4 03.8	202 54.1	+ 3 08.7	157 51.9	72	−21 30.4	−114
7	36 20.5	239 40.5	30.8	298 45.8	58.8	23 25.4	03.9	217 56.4	08.6	172 18.1	70	21 41.8	−114
8	51 22.9	254 41.3	29.8	313 46.4	58.8	38 27.7	03.9	232 58.7	08.6	186 44.1	70	21 53.2	−112
9	66 25.4	269 42.1	·· 28.8	328 47.0	·· 58.7	53 30.0	·· 04.0	248 01.0	·· 08.5	201 10.1	68	·22 04.4	−112
10	81 27.9	284 42.9	27.9	343 47.7	58.6	68 32.3	04.0	263 03.3	08.4	215 35.9	66	22 15.6	−109
11	96 30.3	299 43.7	26.9	358 48.3	58.6	83 34.6	04.1	278 05.6	08.3	230 01.5	65	22 26.5	−109
12	111 32.8	314 44.4	+ 9 25.9	13 49.0	+23 58.5	98 37.0	+ 4 04.1	293 08.0	+ 3 08.3	244 27.0	64	−22 37.4	−107
13	126 35.3	329 45.2	24.9	28 49.6	58.4	113 39.3	04.2	308 10.3	08.2	258 52.4	63	22 48.1	−107
14	141 37.7	344 46.0	23.9	43 50.2	58.4	128 41.6	04.2	323 12.6	08.1	273 17.7	61	22 58.8	−104
15	156 40.2	359 46.8	·· 22.9	58 50.9	·· 58.3	143 43.9	·· 04.3	338 14.9	·· 08.0	287 42.8	59	·23 09.2	−104
16	171 42.7	14 47.6	21.9	73 51.5	58.2	158 46.2	04.3	353 17.2	07.9	302 07.7	58	23 19.6	−102
17	186 45.1	29 48.4	20.9	88 52.2	58.2	173 48.5	04.4	8 19.5	07.9	316 32.5	57	23 29.8	−100
18	201 47.6	44 49.2	+ 9 19.9	103 52.8	+23 58.1	188 50.8	+ 4 04.4	23 21.8	+ 3 07.8	330 57.2	55	−23 39.8	− 99
19	216 50.1	59 50.0	18.9	118 53.4	58.0	203 53.1	04.5	38 24.1	07.7	345 21.7	54	23 49.7	− 98
20	231 52.5	74 50.8	17.9	133 54.1	57.9	218 55.4	04.6	53 26.4	07.6	359 46.1	53	23 59.5	− 96
21	246 55.0	89 51.6	·· 16.9	148 54.7	·· 57.9	233 57.7	·· 04.6	68 28.7	·· 07.5	14 10.4	51	·24 09.1	− 95
22	261 57.4	104 52.4	16.0	163 55.3	57.8	249 00.0	04.7	83 31.0	07.5	28 34.5	50	24 18.6	− 93
23	276 59.9	119 53.2	15.0	178 56.0	57.7	264 02.3	04.7	98 33.3	07.4	42 58.5	49	24 27.9	− 92
24	292 02.4	134 54.0	+ 9 14.0	193 56.6	+23 57.7	279 04.7	+ 4 04.8	113 35.6	+ 3 07.3	57 22.4	47	−24 37.1	− 90
code	—	+ 8	− 10	+ 6	0	+ 23	+ 1	+ 23	− 1				

GCT	SUN GHA	SUN Dec.
h	° ′	° ′
0	178 39.7	+22 07.2
1	193 39.6	06.9
2	208 39.5	06.6
3	223 39.5	·· 06.2
4	238 39.4	05.9
5	253 39.3	05.6
6	268 39.2	+22 05.2
7	283 39.1	04.9
8	298 39.0	04.6
9	313 39.0	·· 04.2
10	328 38.9	03.9
11	343 38.8	03.6
12	358 38.7	+22 03.2
13	13 38.6	02.9
14	28 38.5	02.5
15	43 38.5	·· 02.2
16	58 38.4	01.9
17	73 38.3	01.5
18	88 38.2	+22 01.2
19	103 38.1	00.8
20	118 38.1	00.5
21	133 38.0	·22 00.1
22	148 37.9	21 59.8
23	163 37.8	59.4
0	178 37.7	+21 59.1
1	193 37.7	58.8
2	208 37.6	58.4
3	223 37.5	·· 58.1
4	238 37.4	57.7
5	253 37.4	57.4
6	268 37.3	+21 57.0
7	283 37.2	56.7
8	298 37.1	56.3
9	313 37.0	·· 56.0
10	328 37.0	55.6
11	343 36.9	55.2
12	358 36.8	+21 54.9
13	13 36.7	54.5
14	28 36.7	54.2
15	43 36.6	·· 53.8
16	58 36.5	53.5
17	73 36.4	53.1
18	88 36.4	+21 52.8
19	103 36.3	52.4
20	118 36.2	52.0
21	133 36.1	·· 51.7
22	148 36.1	51.3
23	163 36.0	51.0
0	178 35.9	+21 50.6
1	193 35.8	50.2
2	208 35.8	49.9
3	223 35.7	·· 49.5
4	238 35.6	49.1
5	253 35.5	48.8
6	268 35.5	+21 48.4
7	283 35.4	48.0
8	298 35.3	47.7
9	313 35.2	·· 47.3
10	328 35.2	46.9
11	343 35.1	46.6
12	358 35.0	+21 46.2
13	13 35.0	45.8
14	28 34.9	45.5
15	43 34.8	·· 45.1
16	58 34.7	44.7
17	73 34.7	44.3
18	88 34.6	+21 44.0
19	103 34.5	43.6
20	118 34.5	43.2
21	133 34.4	·· 42.8
22	148 34.3	42.5
23	163 34.3	42.1
24	178 34.2	+21 41.7
code	—	– 4

STARS No.	SHA	Dec.	Transit Mer. Gr.
	° ′	° ′	h m
1	358 31.7	+28 49.3	4 45
2	358 21.3	+58 52.7	4 46
3	349 42.5	−18 14.9	5 20
4	339 20.8	+59 58.9	6 01
5	336 01.1	−57 28.5	6 15
6	332 41.9	+89 01.9	6 28
7	328 53.5	+23 14.1	6 43
8	315 53.7	−40 29.5	7 35
9	309 47.5	+49 41.4	7 59
10	291 43.1	+16 24.9	9 11
11	281 57.1	− 8 15.2	9 50
12	281 43.8	+45 57.1	9 51
13	279 22.3	+ 6 18.6	10 01
14	279 11.9	+28 34.2	10 01
15	276 33.9	− 1 13.7	10 12
16	271 52.0	+ 7 24.2	10 31
17	264 17.4	−52 39.9	11 01
18	259 15.1	−16 38.7	11 21
19	255 49.5	−28 54.1	11 35
20	245 48.8	+ 5 21.2	12 14
21	244 25.0	+28 08.9	12 20
22	234 37.9	−59 21.1	12 59
23	223 27.3	−43 14.2	13 44
24	221 50.9	−69 31.1	13 50
25	218 42.1	− 8 26.8	14 03
26	208 33.3	+12 12.4	14 43
27	194 48.8	+62 01.1	15 38
28	183 21.2	+14 50.7	16 24
29	174 02.0	−62 50.2	17 01
30	172 53.3	−56 50.8	17 05
31	168 47.1	−59 25.8	17 22
32	167 01.3	+56 13.6	17 29
33	159 30.1	+55 10.9	17 59
34	159 20.4	−10 54.6	17 59
35	153 35.2	+49 33.5	18 22
36	149 02.6	−36 08.2	18 40
37	146 38.1	+19 26.1	18 50
38	140 55.5	−60 38.6	19 13
39	137 16.8	+74 21.4	19 27
40	126 50.2	+26 52.6	20 09
41	120 37.8	−22 29.3	20 34
42	113 23.2	−26 19.8	21 03
43	109 06.5	−68 56.8	21 20
44	103 05.7	−15 40.1	21 44
45	97 24.8	−37 04.4	22 06
46	96 49.4	+12 35.6	22 09
47	91 07.3	+51 29.6	22 32
48	84 45.2	−34 24.7	22 57
49	81 10.1	+38 44.2	23 11
50	76 55.6	−26 21.6	23 28
51	62 53.3	+ 8 44.3	0 28
52	54 31.8	−56 53.5	1 01
53	50 02.9	+45 06.3	1 19
54	34 32.6	+ 9 39.1	2 21
55	28 41.6	−47 11.6	2 45
56	16 14.9	−29 52.6	3 34
57	14 24.6	+14 56.6	3 41

Lat.	Sunrise	Twlt. begins	Moonrise 12	13	14	15
N °	h m	h m	h m	h m	h m	h m
70	□	□	14 43	17 55	■	■
68	□	□	14 24	16 53	■	■
66	1 23	////	14 09	16 19	■	■
64	2 07	////	13 56	15 54	18 17	■
62	2 36	////	13 46	15 35	17 39	20 03
60	2 58	////	13 37	15 20	17 12	19 09
58	3 16	////	13 29	15 06	16 51	18 37
56	3 31	////	13 22	14 55	16 34	18 13
54	3 43	////	13 16	14 45	16 20	17 54
52	3 55	////	13 10	14 37	16 07	17 38
50	4 04	0 14	13 05	14 29	15 56	17 24
45	4 25	2 01	12 55	14 12	15 33	16 55
40	4 42	2 42	12 46	13 59	15 15	16 33
35	4 55	3 11	12 39	13 47	15 00	16 14
30	5 07	3 32	12 32	13 37	14 47	15 59
20	5 28	4 05	12 21	13 20	14 24	15 32
10	5 46	4 28	12 11	13 06	14 05	15 09
0	6 02	4 48	12 02	12 52	13 47	14 48
10	6 18	5 03	11 53	12 38	13 29	14 27
20	6 35	5 18	11 44	12 24	13 10	14 04
30	6 55	5 30	11 33	12 08	12 49	13 38
35	7 07	5 37	11 27	11 58	12 36	13 23
40	7 20	5 44	11 20	11 48	12 22	13 06
45	7 35	5 51	11 12	11 35	12 05	12 45
50	7 54	5 58	11 03	11 20	11 44	12 18
52	8 03	6 01	10 58	11 13	11 34	12 05
54	8 13	6 04	10 53	11 06	11 23	11 51
56	8 24	6 06	10 48	10 57	11 11	11 34
58	8 37	6 10	10 42	10 47	10 56	11 13
60	8 53	6 14	10 36	10 36	10 39	10 48
S						

Lat.	Sunset	Twlt. ends	Moonset 12	13	14	15
N °	h m	h m	h m	h m	h m	h m
70	□	□	21 18	19 52	■	■
68	□	□	21 40	20 55	■	■
66	22 45	////	21 57	21 31	■	■
64	22 02	////	22 11	21 57	21 31	■
62	21 33	////	22 23	22 17	22 10	21 55
60	21 12	////	22 33	22 34	22 38	22 50
58	20 54	////	22 42	22 48	22 59	23 23
56	20 40	////	22 50	23 00	23 17	23 47
54	20 27	////	22 57	23 11	23 32	24 07
52	20 16	////	23 03	23 20	23 45	24 23
50	20 06	23 43	23 09	23 29	23 57	24 38
45	19 46	22 08	23 21	23 47	24 21	0 21
40	19 29	21 27	23 32	24 02	0 02	0 40
35	19 15	20 59	23 41	24 15	0 15	0 56
30	19 03	20 37	23 48	24 26	0 26	1 11
20	18 43	20 06	24 02	0 02	0 45	1 35
10	18 26	19 43	24 14	0 14	1 02	1 56
0	18 09	19 23	24 25	0 25	1 17	2 15
10	17 53	19 08	24 37	0 37	1 33	2 35
20	17 36	18 54	24 49	0 49	1 50	2 56
30	17 17	18 41	0 00	1 03	2 10	3 21
35	17 05	18 35	0 05	1 11	2 21	3 35
40	16 52	18 28	0 10	1 20	2 35	3 52
45	16 37	18 22	0 16	1 31	2 50	4 12
50	16 18	18 15	0 24	1 44	3 10	4 38
52	16 09	18 12	0 27	1 51	3 19	4 50
54	15 59	18 09	0 31	1 57	3 29	5 04
56	15 47	18 05	0 35	2 05	3 41	5 20
58	15 34	18 02	0 40	2 14	3 55	5 40
60	15 19	17 59	0 46	2 24	4 11	6 05
S						

GCT	Equation of Time (App.—Mean) 12	13	14
h	m s	m s	m s
0	− 5 21.0	− 5 28.9	− 5 36.2
6	− 5 23.0	− 5 30.8	− 5 38.0
12	− 5 25.0	− 5 32.6	− 5 39.7
18	− 5 26.9	− 5 34.4	− 5 41.5
24	− 5 28.9	− 5 36.2	− 5 43.1

GCT of Transit Meridian of Greenwich

DAY	Moon	Venus	Mars	Jupiter	Saturn
	h m	h m	h m	h m	h m
12	18 14	15 03	11 07	5 34	16 34
13	19 05	15 02	11 06	5 30	16 31
14	20 01	15 01	11 05	5 27	16 27
15	21 03	15 00	11 04	5 23	16 23

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb	Venus	Mars
°	′	′	′
0			
	0.1	0.2	0.1
30			
	0.1	0.2	0.0
45			
	0.1	0.2	0.0
60			
	0.1	0.1	0.0
75			
	0.1	0.0	0.0
90			

Moon's Lower Limb
Add

Alt.	12	13	14
°	′	′	′
0			
	16.8	17.8	18.9
4			
	16.8	17.8	18.8
8			
	16.8	17.8	18.8
12			
	16.8	17.8	18.8
16			
	16.8	17.8	18.7
20			
	16.8	17.7	18.7
24			
	16.7	17.7	18.6
28			
	16.7	17.6	18.5
32			
	16.7	17.5	18.4
36			
	16.6	17.5	18.3
40			
	16.6	17.4	18.2
44			
	16.5	17.3	18.1
48			
	16.5	17.2	17.9
52			
	16.4	17.1	17.8
56			
	16.4	17.0	17.6
60			
	16.3	16.9	17.5
64			
	16.2	16.8	17.3
68			
	16.2	16.7	17.1
72			
	16.1	16.5	17.0
76			
	16.0	16.4	16.8
80			
	16.0	16.3	16.6
84			
	15.9	16.2	16.4
88			
	15.8	16.1	16.3
90			

Add to table, back cover

Moon's Upper Limb
Subtract

Alt.	12	13	14
°	′	′	′
0			
	14.8	14.2	13.7
4			
	14.8	14.3	13.7
8			
	14.8	14.3	13.7
12			
	14.9	14.3	13.7
16			
	14.9	14.3	13.8
20			
	14.9	14.4	13.8
24			
	14.9	14.4	13.9
28			
	15.0	14.5	14.0
32			
	15.0	14.5	14.1
36			
	15.0	14.6	14.2
40			
	15.1	14.7	14.3
44			
	15.1	14.8	14.5
48			
	15.2	14.9	14.6
52			
	15.2	15.0	14.7
56			
	15.3	15.1	14.9
60			
	15.4	15.2	15.0
64			
	15.4	15.3	15.2
68			
	15.5	15.4	15.4
72			
	15.5	15.5	15.5
76			
	15.6	15.7	15.7
80			
	15.7	15.8	15.9
84			
	15.8	15.9	16.1
88			
	15.8	16.0	16.2
90			

Subtract from table, back cover

First Quarter 12

GCT	♈	VENUS −4.1		MARS 1.8		JUPITER −2.1		SATURN 1.3		MOON			
	GHA	GHA	Dec.	GHA	Dec.	GHA	Dec.	GHA	Dec.	GHA	code	Dec.	code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
0	292 02.4	134 54.0	+ 9 14.0	193 56.6	+23 57.7	279 04.7	+ 4 04.8	113 35.6	+ 3 07.3	57 22.4	47	−24 37.1	− 90
1	307 04.8	149 54.8	13.0	208 57.3	57.6	294 07.0	04.8	128 37.9	07.2	71 46.1	46	24 46.1	− 89
2	322 07.3	164 55.6	12.0	223 57.9	57.5	309 09.3	04.9	143 40.2	07.1	86 09.7	44	24 55.0	− 87
3	337 09.8	179 56.4	·· 11.0	238 58.5	·· 57.4	324 11.6	·· 04.9	158 42.5	·· 07.1	100 33.1	43	·25 03.7	− 85
4	352 12.2	194 57.2	10.0	253 59.2	57.4	339 13.9	05.0	173 44.8	07.0	114 56.4	42	25 12.2	− 84
5	7 14.7	209 58.0	09.0	268 59.8	57.3	354 16.2	05.0	188 47.0	06.9	129 19.6	40	25 20.6	− 82
6	22 17.2	224 58.8	+ 9 08.0	284 00.5	+23 57.2	9 18.5	+ 4 05.1	203 49.3	+ 3 06.8	143 42.6	40	−25 28.8	− 80
7	37 19.6	239 59.6	07.0	299 01.1	57.1	24 20.8	05.1	218 51.6	06.8	158 05.6	38	25 36.8	− 79
8	52 22.1	255 00.5	06.1	314 01.8	57.1	39 23.1	05.2	233 53.9	06.7	172 28.4	36	25 44.7	− 77
9	67 24.5	270 01.3	·· 05.1	329 02.4	·· 57.0	54 25.5	·· 05.2	248 56.2	·· 06.6	186 51.0	36	·25 52.4	− 75
10	82 27.0	285 02.1	04.1	344 03.0	56.9	69 27.8	05.3	263 58.5	06.5	201 13.6	34	25 59.9	− 74
11	97 29.5	300 02.9	03.1	359 03.7	56.8	84 30.1	05.3	279 00.8	06.4	215 36.0	33	26 07.3	− 71
12	112 31.9	315 03.7	+ 9 02.1	14 04.3	+23 56.8	99 32.4	+ 4 05.4	294 03.1	+ 3 06.4	229 58.3	32	−26 14.4	− 70
13	127 34.4	330 04.6	01.1	29 05.0	56.7	114 34.7	05.4	309 05.4	06.3	244 20.5	30	26 21.4	− 68
14	142 36.9	345 05.4	9 00.1	44 05.6	56.6	129 37.0	05.5	324 07.7	06.2	258 42.5	30	26 28.2	− 67
15	157 39.3	0 06.2	· 8 59.1	59 06.2	·· 56.5	144 39.3	·· 05.5	339 10.0	·· 06.1	273 04.5	28	·26 34.9	− 64
16	172 41.8	15 07.1	58.1	74 06.9	56.5	159 41.7	05.6	354 12.3	06.0	287 26.3	27	26 41.3	− 63
17	187 44.3	30 07.9	57.1	89 07.5	56.4	174 44.0	05.6	9 14.6	06.0	301 48.0	26	26 47.6	− 60
18	202 46.7	45 08.7	+ 8 56.2	104 08.2	+23 56.3	189 46.3	+ 4 05.7	24 16.9	+ 3 05.9	316 09.6	25	−26 53.6	− 59
19	217 49.2	60 09.6	55.2	119 08.8	56.2	204 48.6	05.7	39 19.2	05.8	330 31.1	24	26 59.5	− 57
20	232 51.7	75 10.4	54.2	134 09.5	56.1	219 50.9	05.8	54 21.5	05.7	344 52.5	23	27 05.2	− 54
21	247 54.1	90 11.2	·· 53.2	149 10.1	·· 56.1	234 53.2	·· 05.8	69 23.8	·· 05.6	359 13.8	21	·27 10.6	− 53
22	262 56.6	105 12.1	52.2	164 10.7	56.0	249 55.5	05.9	84 26.1	05.6	13 34.9	21	27 15.9	− 51
23	277 59.0	120 12.9	51.2	179 11.4	55.9	264 57.9	05.9	99 28.4	05.5	27 56.0	20	27 21.0	− 49
0	293 01.5	135 13.8	+ 8 50.2	194 12.0	+23 55.8	280 00.2	+ 4 06.0	114 30.7	+ 3 05.4	42 17.0	19	−27 25.9	− 47
1	308 04.0	150 14.6	49.2	209 12.7	55.7	295 02.5	06.0	129 33.0	05.3	56 37.9	18	27 30.6	− 45
2	323 06.4	165 15.5	48.3	224 13.3	55.7	310 04.8	06.1	144 35.3	05.2	70 58.7	17	27 35.1	− 42
3	338 08.9	180 16.3	·· 47.3	239 14.0	·· 55.6	325 07.1	·· 06.1	159 37.6	·· 05.1	85 19.4	16	·27 39.3	− 41
4	353 11.4	195 17.2	46.3	254 14.6	55.5	340 09.5	06.2	174 39.9	05.1	99 40.0	16	27 43.4	− 39
5	8 13.8	210 18.0	45.3	269 15.2	55.4	355 11.8	06.2	189 42.2	05.0	114 00.6	14	27 47.3	− 36
6	23 16.3	225 18.9	+ 8 44.3	284 15.9	+23 55.3	10 14.1	+ 4 06.3	204 44.5	+ 3 04.9	128 21.0	14	−27 50.9	− 35
7	38 18.8	240 19.7	43.3	299 16.5	55.2	25 16.4	06.3	219 46.8	04.8	142 41.4	13	27 54.4	− 32
8	53 21.2	255 20.6	42.3	314 17.2	55.2	40 18.7	06.4	234 49.1	04.7	157 01.7	13	27 57.6	− 30
9	68 23.7	270 21.5	·· 41.3	329 17.8	·· 55.1	55 21.0	·· 06.4	249 51.4	·· 04.7	171 22.0	11	·28 00.6	− 28
10	83 26.2	285 22.3	40.4	344 18.5	55.0	70 23.4	06.5	264 53.7	04.6	185 42.1	11	28 03.4	− 26
11	98 28.6	300 23.2	39.4	359 19.1	54.9	85 25.7	06.5	279 56.0	04.5	200 02.2	11	28 06.0	− 24
12	113 31.1	315 24.0	+ 8 38.4	14 19.7	+23 54.8	100 28.0	+ 4 06.5	294 58.3	+ 3 04.4	214 22.3	10	−28 08.4	− 22
13	128 33.5	330 24.9	37.4	29 20.4	54.7	115 30.3	06.6	310 00.6	04.3	228 42.3	9	28 10.6	− 19
14	143 36.0	345 25.8	36.4	44 21.0	54.7	130 32.7	06.6	325 02.8	04.3	243 02.2	9	28 12.5	− 17
15	158 38.5	0 26.7	·· 35.4	59 21.7	·· 54.6	145 35.0	·· 06.7	340 05.1	·· 04.2	257 22.1	9	·28 14.2	− 16
16	173 40.9	15 27.5	34.4	74 22.3	54.5	160 37.3	06.7	355 07.4	04.1	271 42.0	8	28 15.8	− 12
17	188 43.4	30 28.4	33.5	89 23.0	54.4	175 39.6	06.8	10 09.7	04.0	286 01.8	7	28 17.0	− 11
18	203 45.9	45 29.3	+ 8 32.5	104 23.6	+23 54.3	190 41.9	+ 4 06.8	25 12.0	+ 3 03.9	300 21.5	7	−28 18.1	− 8
19	218 48.3	60 30.2	31.5	119 24.3	54.2	205 44.3	06.9	40 14.3	03.9	314 41.2	7	28 18.9	− 7
20	233 50.8	75 31.0	30.5	134 24.9	54.1	220 46.6	06.9	55 16.6	03.8	329 00.9	7	28 19.6	− 4
21	248 53.3	90 31.9	·· 29.5	149 25.5	·· 54.0	235 48.9	·· 07.0	70 18.9	·· 03.7	343 20.6	6	·28 20.0	− 1
22	263 55.7	105 32.8	28.5	164 26.2	54.0	250 51.2	07.0	85 21.2	03.6	357 40.2	6	28 20.1	0
23	278 58.2	120 33.7	27.5	179 26.8	53.9	265 53.6	07.1	100 23.5	03.5	11 59.8	6	28 20.1	+ 3
0	294 00.7	135 34.6	+ 8 26.6	194 27.5	+23 53.8	280 55.9	+ 4 07.1	115 25.8	+ 3 03.4	26 19.4	6	−28 19.8	+ 5
1	309 03.1	150 35.5	25.6	209 28.1	53.7	295 58.2	07.2	130 28.1	03.4	40 39.0	6	28 19.3	+ 7
2	324 05.6	165 36.4	24.6	224 28.8	53.6	311 00.5	07.2	145 30.4	03.3	54 58.6	5	28 18.6	+ 9
3	339 08.0	180 37.3	·· 23.6	239 29.4	·· 53.5	326 02.9	·· 07.2	160 32.7	·· 03.2	69 18.1	6	·28 17.7	+ 12
4	354 10.5	195 38.2	22.6	254 30.1	53.4	341 05.2	07.3	175 35.0	03.1	83 37.7	6	28 16.5	+ 14
5	9 13.0	210 39.1	21.6	269 30.7	53.3	356 07.5	07.3	190 37.3	03.0	97 57.3	5	28 15.1	+ 16
6	24 15.4	225 40.0	+ 8 20.7	284 31.4	+23 53.2	11 09.8	+ 4 07.4	205 39.5	+ 3 03.0	112 16.8	6	−28 13.5	+ 19
7	39 17.9	240 40.9	19.7	299 32.0	53.1	26 12.2	07.4	220 41.8	02.9	126 36.4	6	28 11.6	+ 20
8	54 20.4	255 41.8	18.7	314 32.7	53.1	41 14.5	07.5	235 44.1	02.8	140 56.0	6	28 09.6	+ 23
9	69 22.8	270 42.7	·· 17.7	329 33.3	·· 53.0	56 16.8	·· 07.5	250 46.4	·· 02.7	155 15.6	6	·28 07.3	+ 25
10	84 25.3	285 43.6	16.7	344 33.9	52.9	71 19.1	07.6	265 48.7	02.6	169 35.2	7	28 04.8	+ 27
11	99 27.8	300 44.5	15.7	359 34.6	52.8	86 21.5	07.6	280 51.0	02.5	183 54.9	6	28 02.1	+ 30
12	114 30.2	315 45.4	+ 8 14.8	14 35.2	+23 52.7	101 23.8	+ 4 07.7	295 53.3	+ 3 02.5	198 14.5	7	−27 59.1	+ 32
13	129 32.7	330 46.3	13.8	29 35.9	52.6	116 26.1	07.7	310 55.6	02.4	212 34.2	8	27 55.9	+ 34
14	144 35.2	345 47.2	12.8	44 36.5	52.5	131 28.4	07.7	325 57.9	02.3	226 54.0	7	27 52.5	+ 36
15	159 37.6	0 48.1	·· 11.8	59 37.2	·· 52.4	146 30.8	·· 07.8	341 00.2	·· 02.2	241 13.7	9	·27 48.9	+ 38
16	174 40.1	15 49.0	10.8	74 37.8	52.3	161 33.1	07.8	356 02.5	02.1	255 33.6	8	27 45.1	+ 41
17	189 42.5	30 50.0	09.8	89 38.5	52.2	176 35.4	07.9	11 04.8	02.1	269 53.4	9	27 41.0	+ 43
18	204 45.0	45 50.9	+ 8 08.9	104 39.1	+23 52.1	191 37.8	+ 4 07.9	26 07.1	+ 3 02.0	284 13.3	10	−27 36.7	+ 44
19	219 47.5	60 51.8	07.9	119 39.8	52.0	206 40.1	08.0	41 09.3	01.9	298 33.3	10	27 32.3	+ 47
20	234 49.9	75 52.7	06.9	134 40.4	51.9	221 42.4	08.0	56 11.6	01.8	312 53.3	11	27 27.6	+ 50
21	249 52.4	90 53.7	·· 05.9	149 41.1	·· 51.8	236 44.7	·· 08.0	71 13.9	·· 01.7	327 13.4	11	·27 22.6	+ 51
22	264 54.9	105 54.6	04.9	164 41.7	51.7	251 47.1	08.1	86 16.2	01.6	341 33.5	12	27 17.5	+ 54
23	279 57.3	120 55.5	04.0	179 42.4	51.6	266 49.4	08.1	101 18.5	01.6	355 53.7	13	27 12.1	+ 55
24	294 59.8	135 56.5	+ 8 03.0	194 43.0	+23 51.5	281 51.7	+ 4 08.2	116 20.8	+ 3 01.5	10 14.0	13	−27 06.6	+ 58
code	—	+ 9	− 10	+ 7	− 1	+ 23	+ 1	+ 23	− 1				

GCT	SUN GHA	Dec.
h	° ′	° ′
0	178 34.2	+21 41.7
1	193 34.1	41.3
2	208 34.0	41.0
3	223 34.0 ··	40.6
4	238 33.9	40.2
5	253 33.8	39.8
6	268 33.8	+21 39.4
7	283 33.7	39.0
8	298 33.6	38.7
9	313 33.6 ··	38.3
10	328 33.5	37.9
11	343 33.4	37.5
12	358 33.4	+21 37.1
13	13 33.3	36.7
14	28 33.2	36.4
15	43 33.2 ··	36.0
16	58 33.1	35.6
17	73 33.0	35.2
18	88 33.0	+21 34.8
19	103 32.9	34.4
20	118 32.9	34.0
21	133 32.8 ··	33.6
22	148 32.7	33.2
23	163 32.7	32.9
0	178 32.6	+21 32.5
1	193 32.5	32.1
2	208 32.5	31.7
3	223 32.4 ··	31.3
4	238 32.3	30.9
5	253 32.3	30.5
6	268 32.2	+21 30.1
7	283 32.2	29.7
8	298 32.1	29.3
9	313 32.0 ··	28.9
10	328 32.0	28.5
11	343 31.9	28.1
12	358 31.9	+21 27.7
13	13 31.8	27.3
14	28 31.7	26.9
15	43 31.7 ··	26.5
16	58 31.6	26.1
17	73 31.5	25.7
18	88 31.5	+21 25.3
19	103 31.4	24.9
20	118 31.4	24.5
21	133 31.3 ··	24.1
22	148 31.3	23.7
23	163 31.2	23.2
0	178 31.1	+21 22.8
1	193 31.1	22.4
2	208 31.0	22.0
3	223 31.0 ··	21.6
4	238 30.9	21.2
5	253 30.8	20.8
6	268 30.8	+21 20.4
7	283 30.7	20.0
8	298 30.7	19.6
9	313 30.6 ··	19.1
10	328 30.6	18.7
11	343 30.5	18.3
12	358 30.5	+21 17.9
13	13 30.4	17.5
14	28 30.3	17.1
15	43 30.3 ··	16.6
16	58 30.2	16.2
17	73 30.2	15.8
18	88 30.1	+21 15.4
19	103 30.1	15.0
20	118 30.0	14.6
21	133 30.0 ··	14.1
22	148 29.9	13.7
23	163 29.9	13.3
24	178 29.8	+21 12.9
code	—	− 4

STARS No.	SHA	Dec.	Transit Mer. Gr.
	° ′	° ′	h m
1	358 31.7	+28 49.3	4 33
2	358 21.3	+58 52.8	4 34
3	349 42.4	−18 14.9	5 08
4	339 20.7	+59 58.9	5 50
5	336 01.1	−57 28.5	6 03
6	332 40.9	+89 01.9	6 16
7	328 53.5	+23 14.1	6 31
8	315 53.7	−40 29.5	7 23
9	309 47.5	+49 41.4	7 47
10	291 43.1	+16 24.9	9 00
11	281 57.1	− 8 15.1	9 39
12	281 43.7	+45 57.1	9 39
13	279 22.3	+ 6 18.6	9 49
14	279 11.8	+28 34.2	9 49
15	276 33.9	− 1 13.7	10 00
16	271 52.0	+ 7 24.2	10 19
17	264 17.4	−52 39.9	10 49
18	259 15.1	−16 38.7	11 09
19	255 49.5	−28 54.1	11 23
20	245 48.8	+ 5 21.2	12 03
21	244 25.0	+28 08.9	12 08
22	234 37.9	−59 21.1	12 47
23	223 27.3	−43 14.2	13 32
24	221 50.9	−69 31.1	13 38
25	218 42.1	− 8 26.8	13 51
26	208 33.3	+12 12.4	14 31
27	194 48.8	+62 01.0	15 26
28	183 21.2	+14 50.7	16 12
29	174 02.0	−62 50.2	16 49
30	172 53.3	−56 50.8	16 54
31	168 47.1	−59 25.8	17 10
32	167 01.3	+56 13.6	17 17
33	159 30.1	+55 10.9	17 47
34	159 20.4	−10 54.6	17 48
35	153 35.3	+49 33.5	18 11
36	149 02.6	−36 08.2	18 29
37	146 38.1	+19 26.1	18 38
38	140 55.5	−60 38.6	19 01
39	137 16.9	+74 21.4	19 16
40	126 50.2	+26 52.6	19 57
41	120 37.8	−22 29.3	20 22
42	113 23.2	−26 19.8	20 51
43	109 06.5	−68 56.8	21 08
44	103 05.7	−15 40.1	21 32
45	97 24.8	−37 04.4	21 55
46	96 49.4	+12 35.6	21 57
47	91 07.3	+51 29.6	22 20
48	84 45.1	−34 24.7	22 45
49	81 10.1	+38 44.2	22 59
50	76 55.6	−26 21.6	23 16
51	62 53.3	+ 8 44.3	0 16
52	54 31.7	−56 53.5	0 50
53	50 02.9	+45 06.3	1 08
54	34 32.6	+ 9 39.1	2 09
55	28 41.5	−47 11.6	2 33
56	16 14.9	−29 52.6	3 22
57	14 24.6	+14 56.6	3 30

Lat.	Sunrise	Twlt. begins	Moonrise 15	16	17	18
N °	h m	h m	h m	h m	h m	h m
70	□	□	■	■	■	■
68	□	□	■	■	■	■
66	1 36	////	■	■	■	■
64	2 16	////	■	■	■	22 48
62	2 43	////	20 03	■	22 24	22 10
60	3 04	////	19 09	20 47	21 30	21 43
58	3 21	////	18 37	20 06	20 58	21 22
56	3 35	////	18 13	19 38	20 33	21 04
54	3 47	////	17 54	19 16	20 14	20 49
52	3 58	////	17 38	18 57	19 57	20 36
50	4 08	0 42	17 24	18 42	19 43	20 25
45	4 28	2 06	16 55	18 11	19 13	20 01
40	4 44	2 46	16 33	17 47	18 50	19 42
35	4 57	3 14	16 14	17 27	18 31	19 25
30	5 09	3 35	15 59	17 10	18 15	19 11
20	5 29	4 07	15 32	16 41	17 47	18 47
10	5 46	4 30	15 09	16 17	17 24	18 26
0	6 02	4 48	14 48	15 54	17 01	18 07
10	6 18	5 04	14 27	15 31	16 39	17 47
20	6 35	5 17	14 04	15 07	16 15	17 26
30	6 54	5 30	13 38	14 38	15 47	17 02
35	7 05	5 37	13 23	14 22	15 31	16 47
40	7 18	5 43	13 06	14 02	15 12	16 31
45	7 33	5 49	12 45	13 39	14 49	16 11
50	7 52	5 55	12 18	13 08	14 19	15 45
52	8 00	5 58	12 05	12 54	14 04	15 33
54	8 10	6 01	11 51	12 36	13 47	15 19
56	8 21	6 04	11 34	12 16	13 26	15 02
58	8 33	6 08	11 13	11 50	13 00	14 42
60	8 48	6 10	10 48	11 14	12 25	14 18
S						

Lat.	Sunset	Twlt. ends	Moonset 15	16	17	18
N °	h m	h m	h m	h m	h m	h m
70	□	□	■	■	■	■
68	□	□	■	■	■	■
66	22 32	////	■	■	■	■
64	21 54	////	■	■	■	■
62	21 27	////	21 55	■	■	0 17
60	21 07	////	22 50	23 33	25 11	1 11
58	20 50	////	23 23	24 14	0 14	1 43
56	20 36	////	23 47	24 42	0 42	2 07
54	20 24	////	24 07	0 07	1 04	2 27
52	20 13	////	24 23	0 23	1 22	2 43
50	20 04	23 23	24 38	0 38	1 38	2 57
45	19 44	22 04	0 21	1 07	2 09	3 26
40	19 28	21 25	0 40	1 30	2 33	3 48
35	19 14	20 57	0 56	1 49	2 53	4 06
30	19 03	20 37	1 11	2 05	3 10	4 22
20	18 43	20 05	1 35	2 33	3 39	4 49
10	18 25	19 41	1 56	2 57	4 03	5 12
0	18 10	19 24	2 15	3 19	4 26	5 33
10	17 54	19 08	2 35	3 41	4 49	5 54
20	17 37	18 55	2 56	4 05	5 13	6 16
30	17 18	18 42	3 21	4 33	5 41	6 42
35	17 07	18 36	3 35	4 49	5 58	6 58
40	16 54	18 30	3 52	5 08	6 18	7 15
45	16 40	18 25	4 12	5 31	6 41	7 36
50	16 21	18 17	4 38	6 01	7 11	8 02
52	16 13	18 15	4 50	6 16	7 26	8 15
54	16 03	18 12	5 04	6 33	7 43	8 30
56	15 52	18 09	5 20	6 54	8 04	8 47
58	15 39	18 06	5 40	7 20	8 30	9 07
60	15 25	18 03	6 05	7 55	9 06	9 33
S						

GCT	Equation of Time (App.—Mean) 15	16	17
h	m s	m s	m s
0	− 5 43.1	− 5 49.5	− 5 55.3
6	− 5 44.8	− 5 51.0	− 5 56.7
12	− 5 46.4	− 5 52.5	− 5 58.1
18	− 5 47.9	− 5 53.9	− 5 59.4
24	− 5 49.5	− 5 55.3	− 6 00.7

GCT of Transit Meridian of Greenwich

DAY	Moon	Venus	Mars	Jupiter	Saturn
	h m	h m	h m	h m	h m
15	21 03	15 00	11 04	5 23	16 23
16	22 10	14 58	11 03	5 19	16 19
17	23 17	14 57	11 02	5 16	16 16
18	24 22	14 55	11 01	5 12	16 12

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb	Venus	Mars
°	′	′	′
0			
30	0.1	0.3	0.1
45	0.1	0.2	0.0
60	0.1	0.2	0.0
75	0.1	0.1	0.0
90	0.1	0.0	0.0

Moon's Lower Limb *Add*

Alt.	15	16	17
°	′	′	′
0			
4	19.7	20.5	20.9
8	19.7	20.5	20.9
12	19.7	20.5	20.8
16	19.7	20.4	20.8
20	19.6	20.3	20.7
24	19.5	20.2	20.6
28	19.4	20.1	20.5
32	19.3	20.0	20.3
36	19.2	19.8	20.2
40	19.1	19.7	20.0
44	18.9	19.5	19.8
48	18.7	19.3	19.6
52	18.6	19.1	19.4
56	18.4	18.9	19.2
60	18.2	18.7	18.9
64	18.0	18.4	18.7
68	17.8	18.2	18.4
72	17.6	17.9	18.1
76	17.4	17.7	17.9
80	17.1	17.4	17.6
84	16.9	17.2	17.3
88	16.7	16.9	17.0
90	16.5	16.7	16.8

Add to table, back cover

Moon's Upper Limb *Subtract*

Alt.	15	16	17
°	′	′	′
0			
4	13.2	12.7	12.5
8	13.2	12.7	12.5
12	13.2	12.8	12.6
16	13.2	12.8	12.6
20	13.3	12.9	12.7
24	13.4	13.0	12.8
28	13.5	13.1	12.9
32	13.6	13.2	13.1
36	13.7	13.4	13.2
40	13.8	13.5	13.4
44	14.0	13.7	13.6
48	14.2	13.9	13.8
52	14.3	14.1	14.0
56	14.5	14.3	14.2
60	14.7	14.5	14.5
64	14.9	14.8	14.7
68	15.1	15.0	15.0
72	15.3	15.3	15.3
76	15.5	15.5	15.5
80	15.8	15.8	15.8
84	16.0	16.1	16.1
88	16.2	16.3	16.4
90	16.4	16.5	16.6

Subtract from table, back cover

GCT	♈	VENUS −4.2		MARS 1.8		JUPITER −2.2		SATURN 1.3		MOON			
	GHA	GHA	Dec.	GHA	Dec.	GHA	Dec.	GHA	Dec.	GHA	code	Dec.	code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
0	294 59.8	135 56.5	+ 8 03.0	194 43.0	+23 51.5	281 51.7	+ 4 08.2	116 20.8	+ 3 01.5	10 14.0	13	−27 06.6	+ 58
1	310 02.3	150 57.4	02.0	209 43.7	51.4	296 54.1	08.2	131 23.1	01.4	24 34.3	15	27 00.8	+ 60
2	325 04.7	165 58.3	01.0	224 44.3	51.4	311 56.4	08.3	146 25.4	01.3	38 54.8	14	26 54.8	+ 61
3	340 07.2	180 59.3	· 8 00.0	239 45.0	·· 51.3	326 58.7	·· 08.3	161 27.7	·· 01.2	53 15.2	16	·26 48.7	+ 64
4	355 09.6	196 00.2	7 59.1	254 45.6	51.2	342 01.1	08.3	176 30.0	01.1	67 35.8	17	26 42.3	+ 66
5	10 12.1	211 01.1	58.1	269 46.3	51.1	357 03.4	08.4	191 32.3	01.1	81 56.5	17	26 35.7	+ 68
6	25 14.6	226 02.1	+ 7 57.1	284 46.9	+23 51.0	12 05.7	+ 4 08.4	206 34.5	+ 3 01.0	96 17.2	18	−26 28.9	+ 70
7	40 17.0	241 03.0	56.1	299 47.6	50.9	27 08.1	08.5	221 36.8	00.9	110 38.0	20	26 21.9	+ 72
8	55 19.5	256 04.0	55.1	314 48.2	50.8	42 10.4	08.5	236 39.1	00.8	124 59.0	20	26 14.7	+ 74
9	70 22.0	271 04.9	·· 54.2	329 48.9	·· 50.7	57 12.7	·· 08.6	251 41.4	·· 00.7	139 20.0	21	·26 07.3	+ 76
10	85 24.4	286 05.9	53.2	344 49.5	50.6	72 15.1	08.6	266 43.7	00.6	153 41.1	22	25 59.7	+ 78
11	100 26.9	301 06.8	52.2	359 50.2	50.5	87 17.4	08.6	281 46.0	00.6	168 02.3	23	25 51.9	+ 80
12	115 29.4	316 07.8	+ 7 51.2	14 50.8	+23 50.4	102 19.7	+ 4 08.7	296 48.3	+ 3 00.5	182 23.6	24	−25 43.9	+ 81
13	130 31.8	331 08.7	50.3	29 51.5	50.3	117 22.1	08.7	311 50.6	00.4	196 45.0	25	25 35.8	+ 84
14	145 34.3	346 09.7	49.3	44 52.1	50.2	132 24.4	08.8	326 52.9	00.3	211 06.5	26	25 27.4	+ 86
15	160 36.8	1 10.7	·· 48.3	59 52.8	·· 50.0	147 26.7	·· 08.8	341 55.1	·· 00.2	225 28.1	28	·25 18.8	+ 87
16	175 39.2	16 11.6	47.3	74 53.4	49.9	162 29.1	08.8	356 57.4	00.1	239 49.9	28	25 10.1	+ 89
17	190 41.7	31 12.6	46.3	89 54.1	49.8	177 31.4	08.9	11 59.7	00.1	254 11.7	30	25 01.2	+ 91
18	205 44.1	46 13.5	+ 7 45.4	104 54.7	+23 49.7	192 33.7	+ 4 08.9	27 02.0	+ 3 00.0	268 33.7	30	−24 52.1	+ 93
19	220 46.6	61 14.5	44.4	119 55.4	49.6	207 36.1	09.0	42 04.3	2 59.9	282 55.7	32	24 42.8	+ 94
20	235 49.1	76 15.5	43.4	134 56.0	49.5	222 38.4	09.0	57 06.6	59.8	297 17.9	33	24 33.4	+ 96
21	250 51.5	91 16.5	·· 42.4	149 56.7	·· 49.4	237 40.8	·· 09.1	72 08.9	·· 59.7	311 40.2	34	·24 23.8	+ 98
22	265 54.0	106 17.4	41.5	164 57.3	49.3	252 43.1	09.1	87 11.2	59.6	326 02.6	36	24 14.0	+100
23	280 56.5	121 18.4	40.5	179 58.0	49.2	267 45.4	09.1	102 13.5	59.6	340 25.2	36	24 04.0	+101
0	295 58.9	136 19.4	+ 7 39.5	194 58.6	+23 49.1	282 47.8	+ 4 09.2	117 15.7	+ 2 59.5	354 47.8	38	−23 53.9	+103
1	311 01.4	151 20.4	38.5	209 59.3	49.0	297 50.1	09.2	132 18.0	59.4	9 10.6	39	23 43.6	+105
2	326 03.9	166 21.3	37.6	224 59.9	48.9	312 52.4	09.3	147 20.3	59.3	23 33.5	41	23 33.1	+106
3	341 06.3	181 22.3	·· 36.6	240 00.6	·· 48.8	327 54.8	·· 09.3	162 22.6	·· 59.2	37 56.6	41	·23 22.5	+108
4	356 08.8	196 23.3	35.6	255 01.2	48.7	342 57.1	09.3	177 24.9	59.1	52 19.7	43	23 11.7	+110
5	11 11.3	211 24.3	34.6	270 01.9	48.6	357 59.5	09.4	192 27.2	59.1	66 43.0	44	23 00.7	+110
6	26 13.7	226 25.3	+ 7 33.7	285 02.5	+23 48.5	13 01.8	+ 4 09.4	207 29.5	+ 2 59.0	81 06.4	46	−22 49.7	+113
7	41 16.2	241 26.3	32.7	300 03.2	48.4	28 04.1	09.4	222 31.8	58.9	95 30.0	46	22 38.4	+114
8	56 18.6	256 27.3	31.7	315 03.8	48.3	43 06.5	09.5	237 34.0	58.8	109 53.6	48	22 27.0	+115
9	71 21.1	271 28.3	·· 30.7	330 04.5	·· 48.2	58 08.8	·· 09.5	252 36.3	·· 58.7	124 17.4	50	·22 15.5	+117
10	86 23.6	286 29.3	29.8	345 05.1	48.0	73 11.2	09.6	267 38.6	58.6	138 41.4	50	22 03.8	+119
11	101 26.0	301 30.3	28.8	0 05.8	47.9	88 13.5	09.6	282 40.9	58.6	153 05.4	52	21 51.9	+119
12	116 28.5	316 31.3	+ 7 27.8	15 06.4	+23 47.8	103 15.9	+ 4 09.6	297 43.2	+ 2 58.5	167 29.6	54	−21 40.0	+121
13	131 31.0	331 32.3	26.9	30 07.1	47.7	118 18.2	09.7	312 45.5	58.4	181 54.0	54	21 27.9	+123
14	146 33.4	346 33.3	25.9	45 07.7	47.6	133 20.5	09.7	327 47.8	58.3	196 18.4	56	21 15.6	+124
15	161 35.9	1 34.3	·· 24.9	60 08.4	·· 47.5	148 22.9	·· 09.8	342 50.1	·· 58.2	210 43.0	58	·21 03.2	+125
16	176 38.4	16 35.3	23.9	75 09.1	47.4	163 25.2	09.8	357 52.3	58.1	225 07.8	58	20 50.7	+126
17	191 40.8	31 36.3	23.0	90 09.7	47.3	178 27.6	09.8	12 54.6	58.0	239 32.6	60	20 38.1	+128
18	206 43.3	46 37.3	+ 7 22.0	105 10.4	+23 47.2	193 29.9	+ 4 09.9	27 56.9	+ 2 58.0	253 57.6	62	−20 25.3	+129
19	221 45.8	61 38.3	21.0	120 11.0	47.0	208 32.2	09.9	42 59.2	57.9	268 22.8	62	20 12.4	+130
20	236 48.2	76 39.3	20.1	135 11.7	46.9	223 34.6	09.9	58 01.5	57.8	282 48.0	64	19 59.4	+131
21	251 50.7	91 40.4	·· 19.1	150 12.3	·· 46.8	238 36.9	·· 10.0	73 03.8	·· 57.7	297 13.4	65	·19 46.3	+132
22	266 53.1	106 41.4	18.1	165 13.0	46.7	253 39.3	10.0	88 06.1	57.6	311 38.9	67	19 33.1	+134
23	281 55.6	121 42.4	17.2	180 13.6	46.6	268 41.6	10.1	103 08.3	57.5	326 04.6	68	19 19.7	+135
0	296 58.1	136 43.4	+ 7 16.2	195 14.3	+23 46.5	283 44.0	+ 4 10.1	118 10.6	+ 2 57.5	340 30.4	69	−19 06.2	+135
1	312 00.5	151 44.5	15.2	210 14.9	46.4	298 46.3	10.1	133 12.9	57.4	354 56.3	71	18 52.7	+137
2	327 03.0	166 45.5	14.2	225 15.6	46.3	313 48.7	10.2	148 15.2	57.3	9 22.4	72	18 39.0	+138
3	342 05.5	181 46.5	·· 13.3	240 16.3	·· 46.1	328 51.0	·· 10.2	163 17.5	·· 57.2	23 48.6	73	·18 25.2	+139
4	357 07.9	196 47.5	12.3	255 16.9	46.0	343 53.4	10.2	178 19.8	57.1	38 14.9	74	18 11.3	+140
5	12 10.4	211 48.6	11.3	270 17.6	45.9	358 55.7	10.3	193 22.0	57.0	52 41.3	76	17 57.3	+141
6	27 12.9	226 49.6	+ 7 10.4	285 18.2	+23 45.8	13 58.0	+ 4 10.3	208 24.3	+ 2 56.9	67 07.9	77	−17 43.2	+141
7	42 15.3	241 50.6	09.4	300 18.9	45.7	29 00.4	10.4	223 26.6	56.9	81 34.6	79	17 29.1	+143
8	57 17.8	256 51.7	08.4	315 19.5	45.6	44 02.7	10.4	238 28.9	56.8	96 01.5	79	17 14.8	+144
9	72 20.2	271 52.7	·· 07.5	330 20.2	·· 45.4	59 05.1	·· 10.4	253 31.2	·· 56.7	110 28.4	81	·17 00.4	+144
10	87 22.7	286 53.8	06.5	345 20.8	45.3	74 07.4	10.5	268 33.5	56.6	124 55.5	82	16 46.0	+146
11	102 25.2	301 54.8	05.5	0 21.5	45.2	89 09.8	10.5	283 35.8	56.5	139 22.7	84	16 31.4	+146
12	117 27.6	316 55.9	+ 7 04.6	15 22.2	+23 45.1	104 12.1	+ 4 10.5	298 38.0	+ 2 56.4	153 50.1	84	−16 16.8	+147
13	132 30.1	331 56.9	03.6	30 22.8	45.0	119 14.5	10.6	313 40.3	56.3	168 17.5	86	16 02.1	+148
14	147 32.6	346 58.0	02.6	45 23.5	44.9	134 16.8	10.6	328 42.6	56.3	182 45.1	87	15 47.3	+148
15	162 35.0	1 59.0	·· 01.7	60 24.1	·· 44.7	149 19.2	·· 10.6	343 44.9	·· 56.2	197 12.8	89	·15 32.5	+149
16	177 37.5	17 00.1	7 00.7	75 24.8	44.6	164 21.5	10.7	358 47.2	56.1	211 40.7	89	15 17.6	+150
17	192 40.0	32 01.1	6 59.7	90 25.4	44.5	179 23.9	10.7	13 49.5	56.0	226 08.6	91	15 02.6	+151
18	207 42.4	47 02.2	+ 6 58.8	105 26.1	+23 44.4	194 26.2	+ 4 10.7	28 51.7	+ 2 55.9	240 36.7	92	−14 47.5	+152
19	222 44.9	62 03.3	57.8	120 26.7	44.3	209 28.6	10.8	43 54.0	55.8	255 04.9	93	14 32.3	+152
20	237 47.4	77 04.3	56.9	135 27.4	44.1	224 30.9	10.8	58 56.3	55.7	269 33.2	94	14 17.1	+152
21	252 49.8	92 05.4	·· 55.9	150 28.1	·· 44.0	239 33.3	·· 10.8	73 58.6	·· 55.7	284 01.6	95	·14 01.9	+154
22	267 52.3	107 06.5	54.9	165 28.7	43.9	254 35.6	10.9	89 00.9	55.6	298 30.1	97	13 46.5	+154
23	282 54.7	122 07.5	54.0	180 29.4	43.8	269 38.0	10.9	104 03.2	55.5	312 58.8	98	13 31.1	+154
24	297 57.2	137 08.6	+ 6 53.0	195 30.0	+23 43.7	284 40.3	+ 4 10.9	119 05.4	+ 2 55.4	327 27.6	98	−13 15.7	+155
code	—	+ 10	− 9	+ 7	− 1	+ 23	+ 1	+ 23	− 1				

GCT h	SUN GHA ° ′	SUN Dec. ° ′
0	178 29.8	+21 12.9
1	193 29.8	12.4
2	208 29.7	12.0
3	223 29.6	•• 11.6
4	238 29.6	11.2
5	253 29.5	10.7
6	268 29.5	+21 10.3
7	283 29.4	09.9
8	298 29.4	09.5
9	313 29.3	•• 09.0
10	328 29.3	08.6
11	343 29.2	08.2
12	358 29.2	+21 07.7
13	13 29.1	07.3
14	28 29.1	06.9
15	43 29.0	•• 06.4
16	58 29.0	06.0
17	73 28.9	05.6
18	88 28.9	+21 05.1
19	103 28.8	04.7
20	118 28.8	04.3
21	133 28.8	•• 03.8
22	148 28.7	03.4
23	163 28.7	03.0
0	178 28.6	+21 02.5
1	193 28.6	02.1
2	208 28.5	01.7
3	223 28.5	•• 01.2
4	238 28.4	00.8
5	253 28.4	21 00.3
6	268 28.3	+20 59.9
7	283 28.3	59.4
8	298 28.2	59.0
9	313 28.2	•• 58.6
10	328 28.1	58.1
11	343 28.1	57.7
12	358 28.1	+20 57.2
13	13 28.0	56.8
14	28 28.0	56.3
15	43 27.9	•• 55.9
16	58 27.9	55.4
17	73 27.8	55.0
18	88 27.8	+20 54.5
19	103 27.8	54.1
20	118 27.7	53.6
21	133 27.7	•• 53.2
22	148 27.6	52.7
23	163 27.6	52.3
0	178 27.5	+20 51.8
1	193 27.5	51.4
2	208 27.5	50.9
3	223 27.4	•• 50.5
4	238 27.4	50.0
5	253 27.3	49.6
6	268 27.3	+20 49.1
7	283 27.3	48.6
8	298 27.2	48.2
9	313 27.2	•• 47.7
10	328 27.1	47.3
11	343 27.1	46.8
12	358 27.1	+20 46.4
13	13 27.0	45.9
14	28 27.0	45.4
15	43 26.9	•• 45.0
16	58 26.9	44.5
17	73 26.9	44.0
18	88 26.8	+20 43.6
19	103 26.8	43.1
20	118 26.8	42.7
21	133 26.7	•• 42.2
22	148 26.7	41.7
23	163 26.6	41.3
24	178 26.6	+20 40.8
code	—	— 4

STARS No.	SHA ° ′	Dec. ° ′	Transit Mer. Gr. h m
1	358 31.7	+28 49.3	4 21
2	358 21.2	+58 52.8	4 22
3	349 42.4	−18 14.9	4 56
4	339 20.7	+59 58.9	5 38
5	336 01.0	−57 28.5	5 51
6	332 39.9	+89 02.0	6 04
7	328 53.5	+23 14.1	6 19
8	315 53.7	−40 29.5	7 11
9	309 47.4	+49 41.4	7 36
10	291 43.1	+16 24.9	8 48
11	281 57.1	− 8 15.1	9 27
12	281 43.7	+45 57.1	9 28
13	279 22.2	+ 6 18.6	9 37
14	279 11.8	+28 34.2	9 38
15	276 33.9	− 1 13.7	9 48
16	271 52.0	+ 7 24.2	10 07
17	264 17.4	−52 39.8	10 37
18	259 15.1	−16 38.7	10 57
19	255 49.5	−28 54.1	11 11
20	245 48.8	+ 5 21.2	11 51
21	244 24.9	+28 08.9	11 56
22	234 37.9	−59 21.1	12 35
23	223 27.3	−43 14.1	13 20
24	221 51.0	−69 31.1	13 26
25	218 42.1	− 8 26.8	13 39
26	208 33.3	+12 12.4	14 20
27	194 48.8	+62 01.0	15 14
28	183 21.2	+14 50.7	16 00
29	174 02.0	−62 50.2	16 37
30	172 53.3	−56 50.8	16 42
31	168 47.2	−59 25.8	16 58
32	167 01.3	+56 13.6	17 05
33	159 30.1	+55 10.9	17 35
34	159 20.4	−10 54.6	17 36
35	153 35.3	+49 33.5	17 59
36	149 02.6	−36 08.2	18 17
37	146 38.1	+19 26.1	18 27
38	140 55.6	−60 38.7	18 49
39	137 16.9	+74 21.4	19 04
40	126 50.2	+26 52.7	19 45
41	120 37.8	−22 29.3	20 10
42	113 23.2	−26 19.8	20 39
43	109 06.5	−68 56.8	20 56
44	103 05.7	−15 40.1	21 20
45	97 24.8	−37 04.4	21 43
46	96 49.4	+12 35.6	21 45
47	91 07.3	+51 29.7	22 08
48	84 45.1	−34 24.7	22 33
49	81 10.1	+38 44.2	22 48
50	76 55.6	−26 21.6	23 05
51	62 53.3	+ 8 44.3	0 05
52	54 31.7	−56 53.5	0 38
53	50 02.9	+45 06.3	0 56
54	34 32.6	+ 9 39.1	1 58
55	28 41.5	−47 11.6	2 21
56	16 14.9	−29 52.6	3 11
57	14 24.5	+14 56.7	3 18

Lat. °	Sunrise h m	Twlt. begins h m	Moonrise 18 h m	Moonrise 19 h m	Moonrise 20 h m	Moonrise 21 h m
N 70	□	□	■	■	0 12 / 22 56	22 20
68	0 35	////	■	23 20	22 37	22 11
66	1 49	////	■	22 47	22 21	22 04
64	2 25	////	22 48	22 22	22 08	21 58
62	2 50	////	22 10	22 03	21 57	21 52
60	3 10	////	21 43	21 47	21 48	21 48
58	3 26	////	21 22	21 33	21 40	21 44
56	3 40	////	21 04	21 22	21 32	21 40
54	3 51	////	20 49	21 11	21 26	21 37
52	4 02	////	20 36	21 02	21 20	21 33
50	4 11	0 59	20 25	20 54	21 14	21 31
45	4 30	2 11	20 01	20 36	21 03	21 25
40	4 46	2 49	19 42	20 21	20 53	21 19
35	4 59	3 17	19 25	20 09	20 45	21 15
30	5 11	3 37	19 11	19 58	20 37	21 11
20	5 30	4 08	18 47	19 39	20 24	21 04
10	5 47	4 31	18 26	19 23	20 13	20 58
0	6 03	4 48	18 07	19 08	20 03	20 53
10	6 18	5 04	17 47	18 52	19 52	20 47
20	6 34	5 18	17 26	18 35	19 40	20 41
30	6 53	5 30	17 02	18 16	19 27	20 34
35	7 04	5 35	16 47	18 05	19 20	20 30
40	7 16	5 41	16 31	17 52	19 11	20 25
45	7 31	5 48	16 11	17 37	19 01	20 20
50	7 49	5 54	15 45	17 17	18 48	20 14
52	7 57	5 56	15 33	17 08	18 42	20 11
54	8 06	5 59	15 19	16 58	18 36	20 08
56	8 17	6 01	15 02	16 47	18 29	20 04
58	8 29	6 05	14 42	16 33	18 20	20 00
60	8 43	6 08	14 18	16 18	18 11	19 55
S						

Lat. °	Sunset h m	Twlt. ends h m	Moonset 18 h m	Moonset 19 h m	Moonset 20 h m	Moonset 21 h m
N 70	□	□	■	■	2 54	6 02
68	23 25	////	■	■	3 44	6 19
66	22 20	////	■	■	4 16	6 33
64	21 45	////	■	2 09	4 39	6 44
62	21 20	////	0 17	2 47	4 57	6 53
60	21 01	////	1 11	3 13	5 12	7 01
58	20 45	////	1 43	3 34	5 24	7 08
56	20 32	////	2 07	3 51	5 35	7 14
54	20 20	////	2 27	4 05	5 45	7 20
52	20 10	////	2 43	4 17	5 53	7 25
50	20 01	23 09	2 57	4 28	6 01	7 29
45	19 41	21 58	3 26	4 51	6 17	7 39
40	19 26	21 21	3 48	5 09	6 30	7 47
35	19 13	20 55	4 06	5 24	6 41	7 54
30	19 01	20 34	4 22	5 37	6 51	8 00
20	18 42	20 04	4 49	6 00	7 07	8 10
10	18 25	19 41	5 12	6 19	7 21	8 19
0	18 10	19 24	5 33	6 36	7 34	8 27
10	17 55	19 09	5 54	6 54	7 47	8 35
20	17 38	18 55	6 16	7 13	8 01	8 44
30	17 20	18 44	6 42	7 34	8 17	8 53
35	17 09	18 38	6 58	7 46	8 26	8 59
40	16 57	18 32	7 15	8 01	8 36	9 05
45	16 42	18 26	7 36	8 17	8 48	9 12
50	16 24	18 20	8 02	8 38	9 03	9 21
52	16 16	18 18	8 15	8 48	9 09	9 25
54	16 07	18 15	8 30	8 58	9 16	9 29
56	15 56	18 12	8 47	9 11	9 25	9 34
58	15 44	18 09	9 07	9 25	9 34	9 39
60	15 30	18 06	9 33	9 41	9 44	9 45
S						

GCT h	Equation of Time (App.—Mean) 18 m s	19 m s	20 m s
0	− 6 00.7	− 6 05.5	− 6 09.8
6	− 6 01.9	− 6 06.6	− 6 10.7
12	− 6 03.1	− 6 07.7	− 6 11.7
18	− 6 04.3	− 6 08.7	− 6 12.6
24	− 6 05.5	− 6 09.8	− 6 13.5

GCT of Transit Meridian of Greenwich

DAY	Moon h m	Venus h m	Mars h m	Jupiter h m	Saturn h m
18	24 22	14 55	11 01	5 12	16 12
19	0 22	14 54	11 00	5 08	16 09
20	1 21	14 52	10 59	5 04	16 05
21	2 15	14 50	10 58	5 01	16 01

ADDITIONAL ALTITUDE CORRECTIONS

Alt. °	Sun's Low'r Limb ′	Venus ′	Mars ′
0			
	0.1	0.3	0.1
30			
	0.1	0.2	0.0
45			
	0.1	0.2	0.0
60			
	0.1	0.1	0.0
75			
	0.1	0.0	0.0
90			

Moon's Lower Limb *Add*

Alt. °	18 ′	19 ′	20 ′
0			
	20.9	20.4	19.6
4			
	20.9	20.4	19.6
8			
	20.8	20.3	19.6
12			
	20.8	20.3	19.5
16			
	20.7	20.2	19.5
20			
	20.6	20.1	19.4
24			
	20.5	20.0	19.3
28			
	20.3	19.9	19.2
32			
	20.2	19.7	19.1
36			
	20.0	19.6	18.9
40			
	19.8	19.4	18.8
44			
	19.6	19.2	18.6
48			
	19.4	19.0	18.5
52			
	19.2	18.8	18.3
56			
	18.9	18.6	18.1
60			
	18.7	18.4	17.9
64			
	18.4	18.1	17.7
68			
	18.1	17.9	17.5
72			
	17.9	17.6	17.3
76			
	17.6	17.4	17.1
80			
	17.3	17.1	16.9
84			
	17.0	16.9	16.6
88			
	16.8	16.7	16.5
90			

Add to table, back cover

Moon's Upper Limb *Subtract*

Alt. °	18 ′	19 ′	20 ′
0			
	12.5	12.8	13.2
4			
	12.5	12.8	13.2
8			
	12.6	12.8	13.3
12			
	12.6	12.9	13.3
16			
	12.7	13.0	13.4
20			
	12.8	13.1	13.5
24			
	12.9	13.2	13.5
28			
	13.1	13.3	13.6
32			
	13.2	13.4	13.8
36			
	13.4	13.6	13.9
40			
	13.6	13.8	14.0
44			
	13.8	13.9	14.2
48			
	14.0	14.1	14.4
52			
	14.2	14.3	14.5
56			
	14.5	14.6	14.7
60			
	14.7	14.8	14.9
64			
	15.0	15.0	15.1
68			
	15.3	15.3	15.3
72			
	15.5	15.5	15.5
76			
	15.8	15.8	15.8
80			
	16.1	16.1	16.0
84			
	16.4	16.3	16.2
88			
	16.6	16.5	16.4
90			

Subtract from table, back cover

Full Moon 18

GCT	♈ GHA	VENUS −4.2 GHA	VENUS Dec.	MARS 1.8 GHA	MARS Dec.	JUPITER −2.2 GHA	JUPITER Dec.	SATURN 1.3 GHA	SATURN Dec.	MOON GHA	code	MOON Dec.	code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
0	297 57.2	137 08.6	+ 6 53.0	195 30.0	+23 43.7	284 40.3	+ 4 10.9	119 05.4	+ 2 55.4	327 27.6	98	−13 15.7	+155
1	312 59.7	152 09.7	52.0	210 30.7	43.5	299 42.7	11.0	134 07.7	55.3	341 56.4	100	13 00.2	+156
2	328 02.1	167 10.7	51.1	225 31.4	43.4	314 45.0	11.0	149 10.0	55.2	356 25.4	101	12 44.6	+156
3	343 04.6	182 11.8	·· 50.1	240 32.0	·· 43.3	329 47.4	·· 11.0	164 12.3	·· 55.1	10 54.5	102	· 12 29.0	+156
4	358 07.1	197 12.9	49.2	255 32.7	43.2	344 49.8	11.1	179 14.6	55.1	25 23.7	104	12 13.4	+157
5	13 09.5	212 14.0	48.2	270 33.3	43.0	359 52.1	11.1	194 16.8	55.0	39 53.1	104	11 57.7	+158
6	28 12.0	227 15.1	+ 6 47.2	285 34.0	+23 42.9	14 54.5	+ 4 11.1	209 19.1	+ 2 54.9	54 22.5	105	−11 41.9	+158
7	43 14.5	242 16.1	46.3	300 34.6	42.8	29 56.8	11.2	224 21.4	54.8	68 52.0	106	11 26.1	+158
8	58 16.9	257 17.2	45.3	315 35.3	42.7	44 59.2	11.2	239 23.7	54.7	83 21.6	107	11 10.3	+159
9	73 19.4	272 18.3	·· 44.4	330 36.0	·· 42.6	60 01.5	·· 11.2	254 26.0	·· 54.6	97 51.3	109	· 10 54.4	+159
10	88 21.9	287 19.4	43.4	345 36.6	42.4	75 03.9	11.3	269 28.2	54.5	112 21.2	109	10 38.5	+159
11	103 24.3	302 20.5	42.4	0 37.3	42.3	90 06.2	11.3	284 30.5	54.4	126 51.1	110	10 22.6	+160
12	118 26.8	317 21.6	+ 6 41.5	15 37.9	+23 42.2	105 08.6	+ 4 11.3	299 32.8	+ 2 54.4	141 21.1	111	−10 06.6	+160
13	133 29.2	332 22.7	40.5	30 38.6	42.1	120 11.0	11.4	314 35.1	54.3	155 51.2	113	9 50.6	+161
14	148 31.7	347 23.8	39.6	45 39.3	41.9	135 13.3	11.4	329 37.4	54.2	170 21.5	113	9 34.5	+160
15	163 34.2	2 24.9	·· 38.6	60 39.9	·· 41.8	150 15.7	·· 11.4	344 39.7	·· 54.1	184 51.8	114	· 9 18.5	+161
16	178 36.6	17 26.0	37.6	75 40.6	41.7	165 18.0	11.5	359 41.9	54.0	199 22.2	115	9 02.4	+162
17	193 39.1	32 27.1	36.7	90 41.2	41.5	180 20.4	11.5	14 44.2	53.9	213 52.7	115	8 46.2	+161
18	208 41.6	47 28.2	+ 6 35.7	105 41.9	+23 41.4	195 22.7	+ 4 11.5	29 46.5	+ 2 53.8	228 23.2	117	− 8 30.1	+162
19	223 44.0	62 29.3	34.8	120 42.6	41.3	210 25.1	11.6	44 48.8	53.8	242 53.9	118	8 13.9	+162
20	238 46.5	77 30.5	33.8	135 43.2	41.2	225 27.5	11.6	59 51.1	53.7	257 24.7	118	7 57.7	+162
21	253 49.0	92 31.6	·· 32.9	150 43.9	·· 41.0	240 29.8	·· 11.6	74 53.3	·· 53.6	271 55.5	119	· 7 41.5	+162
22	268 51.4	107 32.7	31.9	165 44.5	40.9	255 32.2	11.7	89 55.6	53.5	286 26.4	120	7 25.3	+162
23	283 53.9	122 33.8	31.0	180 45.2	40.8	270 34.5	11.7	104 57.9	53.4	300 57.4	121	7 09.1	+163
0	298 56.4	137 34.9	+ 6 30.0	195 45.9	+23 40.6	285 36.9	+ 4 11.7	120 00.2	+ 2 53.3	315 28.5	122	− 6 52.8	+162
1	313 58.8	152 36.0	29.0	210 46.5	40.5	300 39.2	11.8	135 02.5	53.2	329 59.7	122	6 36.6	+163
2	329 01.3	167 37.2	28.1	225 47.2	40.4	315 41.6	11.8	150 04.7	53.1	344 30.9	124	6 20.3	+163
3	344 03.7	182 38.3	·· 27.1	240 47.8	·· 40.3	330 44.0	·· 11.8	165 07.0	·· 53.1	359 02.3	123	· 6 04.0	+163
4	359 06.2	197 39.4	26.2	255 48.5	40.1	345 46.3	11.8	180 09.3	53.0	13 33.6	125	5 47.7	+163
5	14 08.7	212 40.6	25.2	270 49.2	40.0	0 48.7	11.9	195 11.6	52.9	28 05.1	126	5 31.4	+163
6	29 11.1	227 41.7	+ 6 24.3	285 49.8	+23 39.9	15 51.0	+ 4 11.9	210 13.8	+ 2 52.8	42 36.7	126	− 5 15.1	+163
7	44 13.6	242 42.8	23.3	300 50.5	39.7	30 53.4	11.9	225 16.1	52.7	57 08.3	127	4 58.8	+163
8	59 16.1	257 44.0	22.4	315 51.1	39.6	45 55.8	12.0	240 18.4	52.6	71 40.0	127	4 42.5	+163
9	74 18.5	272 45.1	·· 21.4	330 51.8	·· 39.5	60 58.1	·· 12.0	255 20.7	·· 52.5	86 11.7	128	· 4 26.2	+163
10	89 21.0	287 46.2	20.5	345 52.5	39.3	76 00.5	12.0	270 23.0	52.4	100 43.5	129	4 09.9	+163
11	104 23.5	302 47.4	19.5	0 53.1	39.2	91 02.9	12.1	285 25.2	52.4	115 15.4	129	3 53.6	+162
12	119 25.9	317 48.5	+ 6 18.6	15 53.8	+23 39.1	106 05.2	+ 4 12.1	300 27.5	+ 2 52.3	129 47.3	130	− 3 37.4	+163
13	134 28.4	332 49.7	17.6	30 54.5	38.9	121 07.6	12.1	315 29.8	52.2	144 19.3	131	3 21.1	+163
14	149 30.8	347 50.8	16.7	45 55.1	38.8	136 09.9	12.1	330 32.1	52.1	158 51.4	131	3 04.8	+163
15	164 33.3	2 52.0	·· 15.7	60 55.8	·· 38.7	151 12.3	·· 12.2	345 34.4	·· 52.0	173 23.5	132	· 2 48.5	+162
16	179 35.8	17 53.1	14.8	75 56.4	38.5	166 14.7	12.2	0 36.6	51.9	187 55.7	133	2 32.3	+163
17	194 38.2	32 54.3	13.8	90 57.1	38.4	181 17.0	12.2	15 38.9	51.8	202 28.0	133	2 16.0	+162
18	209 40.7	47 55.4	+ 6 12.9	105 57.8	+23 38.3	196 19.4	+ 4 12.3	30 41.2	+ 2 51.7	217 00.3	133	− 1 59.8	+162
19	224 43.2	62 56.6	11.9	120 58.4	38.1	211 21.8	12.3	45 43.5	51.7	231 32.6	134	1 43.6	+162
20	239 45.6	77 57.8	11.0	135 59.1	38.0	226 24.1	12.3	60 45.7	51.6	246 05.0	134	1 27.4	+162
21	254 48.1	92 58.9	·· 10.0	150 59.8	·· 37.8	241 26.5	·· 12.3	75 48.0	·· 51.5	260 37.4	135	· 1 11.2	+162
22	269 50.6	108 00.1	09.1	166 00.4	37.7	256 28.9	12.4	90 50.3	51.4	275 09.9	136	0 55.0	+161
23	284 53.0	123 01.3	08.1	181 01.1	37.6	271 31.2	12.4	105 52.6	51.3	289 42.5	136	0 38.9	+162
0	299 55.5	138 02.4	+ 6 07.2	196 01.8	+23 37.4	286 33.6	+ 4 12.4	120 54.9	+ 2 51.2	304 15.1	136	− 0 22.7	+161
1	314 58.0	153 03.6	06.2	211 02.4	37.3	301 36.0	12.5	135 57.1	51.1	318 47.7	137	− 0 06.6	+161
2	330 00.4	168 04.8	05.3	226 03.1	37.2	316 38.3	12.5	150 59.4	51.0	333 20.4	137	+ 0 09.5	+160
3	345 02.9	183 06.0	·· 04.3	241 03.7	·· 37.0	331 40.7	·· 12.5	166 01.7	·· 50.9	347 53.1	138	· 0 25.5	+161
4	0 05.3	198 07.1	03.4	256 04.4	36.9	346 43.1	12.5	181 04.0	50.9	2 25.9	138	0 41.6	+160
5	15 07.8	213 08.3	02.5	271 05.1	36.7	1 45.4	12.6	196 06.2	50.8	16 58.7	138	0 57.6	+160
6	30 10.3	228 09.5	+ 6 01.5	286 05.7	+23 36.6	16 47.8	+ 4 12.6	211 08.5	+ 2 50.7	31 31.5	139	+ 1 13.6	+159
7	45 12.7	243 10.7	6 00.6	301 06.4	36.5	31 50.2	12.6	226 10.8	50.6	46 04.4	139	1 29.5	+159
8	60 15.2	258 11.9	5 59.6	316 07.1	36.3	46 52.5	12.6	241 13.1	50.5	60 37.3	140	1 45.4	+159
9	75 17.7	273 13.1	·· 58.7	331 07.7	·· 36.2	61 54.9	·· 12.7	256 15.3	·· 50.4	75 10.3	140	· 2 01.3	+159
10	90 20.1	288 14.3	57.7	346 08.4	36.0	76 57.3	12.7	271 17.6	50.3	89 43.3	140	2 17.2	+158
11	105 22.6	303 15.5	56.8	1 09.1	35.9	91 59.7	12.7	286 19.9	50.2	104 16.3	140	2 33.0	+158
12	120 25.1	318 16.6	+ 5 55.8	16 09.7	+23 35.8	107 02.0	+ 4 12.8	301 22.2	+ 2 50.1	118 49.3	141	+ 2 48.8	+156
13	135 27.5	333 17.8	54.9	31 10.4	35.6	122 04.4	12.8	316 24.4	50.1	133 22.4	141	3 04.6	+157
14	150 30.0	348 19.0	54.0	46 11.1	35.5	137 06.8	12.8	331 26.7	50.0	147 55.5	141	3 20.3	+157
15	165 32.5	3 20.3	·· 53.0	61 11.7	·· 35.3	152 09.1	·· 12.8	346 29.0	·· 49.9	162 28.6	142	· 3 36.0	+157
16	180 34.9	18 21.5	52.1	76 12.4	35.2	167 11.5	12.9	1 31.3	49.8	177 01.8	141	3 51.7	+156
17	195 37.4	33 22.7	51.1	91 13.1	35.0	182 13.9	12.9	16 33.5	49.7	191 34.9	142	4 07.3	+156
18	210 39.8	48 23.9	+ 5 50.2	106 13.7	+23 34.9	197 16.3	+ 4 12.9	31 35.8	+ 2 49.6	206 08.1	143	+ 4 22.9	+155
19	225 42.3	63 25.1	49.3	121 14.4	34.8	212 18.6	12.9	46 38.1	49.5	220 41.4	142	4 38.4	+155
20	240 44.8	78 26.3	48.3	136 15.1	34.6	227 21.0	13.0	61 40.4	49.4	235 14.6	142	4 53.9	+154
21	255 47.2	93 27.5	·· 47.4	151 15.7	·· 34.5	242 23.4	·· 13.0	76 42.6	·· 49.3	249 47.8	143	· 5 09.3	+154
22	270 49.7	108 28.7	46.5	166 16.4	34.3	257 25.7	13.0	91 44.9	49.3	264 21.1	143	5 24.7	+154
23	285 52.2	123 30.0	45.5	181 17.1	34.2	272 28.1	13.0	106 47.2	49.2	278 54.4	143	5 40.1	+153
24	300 54.6	138 31.2	+ 5 44.6	196 17.7	+23 34.0	287 30.5	+ 4 13.1	121 49.5	+ 2 49.1	293 27.7	143	+ 5 55.4	+153
code	—	+ 12	− 10	+ 7	− 2	+ 24	0	+ 23	− 1				

GCT h	SUN GHA ° ′	SUN Dec. ° ′
0	178 26.6	+20 40.8
1	193 26.6	40.3
2	208 26.5	39.9
3	223 26.5	·· 39.4
4	238 26.5	38.9
5	253 26.4	38.4
6	268 26.4	+20 38.0
7	283 26.4	37.5
8	298 26.3	37.0
9	313 26.3	·· 36.6
10	328 26.3	36.1
11	343 26.2	35.6
12	358 26.2	+20 35.1
13	13 26.2	34.7
14	28 26.1	34.2
15	43 26.1	·· 33.7
16	58 26.1	33.2
17	73 26.0	32.8
18	88 26.0	+20 32.3
19	103 26.0	31.8
20	118 25.9	31.3
21	133 25.9	·· 30.8
22	148 25.9	30.4
23	163 25.9	29.9
0	178 25.8	+20 29.4
1	193 25.8	28.9
2	208 25.8	28.4
3	223 25.7	·· 28.0
4	238 25.7	27.5
5	253 25.7	27.0
6	268 25.6	+20 26.5
7	283 25.6	26.0
8	298 25.6	25.5
9	313 25.6	·· 25.0
10	328 25.5	24.6
11	343 25.5	24.1
12	358 25.5	+20 23.6
13	13 25.4	23.1
14	28 25.4	22.6
15	43 25.4	·· 22.1
16	58 25.4	21.6
17	73 25.3	21.1
18	88 25.3	+20 20.6
19	103 25.3	20.1
20	118 25.3	19.6
21	133 25.2	·· 19.1
22	148 25.2	18.7
23	163 25.2	18.2
0	178 25.2	+20 17.7
1	193 25.1	17.2
2	208 25.1	16.7
3	223 25.1	·· 16.2
4	238 25.1	15.7
5	253 25.0	15.2
6	268 25.0	+20 14.7
7	283 25.0	14.2
8	298 25.0	13.7
9	313 25.0	·· 13.2
10	328 24.9	12.7
11	343 24.9	12.2
12	358 24.9	+20 11.7
13	13 24.9	11.2
14	28 24.8	10.7
15	43 24.8	·· 10.2
16	58 24.8	09.7
17	73 24.8	09.1
18	88 24.8	+20 08.6
19	103 24.7	08.1
20	118 24.7	07.6
21	133 24.7	·· 07.1
22	148 24.7	06.6
23	163 24.7	06.1
24	178 24.6	+20 05.6
code	—	− 5

STARS No.	SHA ° ′	Dec. ° ′	Transit Mer. Gr. h m
1	358 31.7	+28 49.3	4 09
2	358 21.2	+58 52.8	4 10
3	349 42.4	−18 14.9	4 45
4	339 20.6	+59 58.9	5 26
5	336 01.0	−57 28.5	5 39
6	332 38.9	+89 02.0	5 53
7	328 53.4	+23 14.1	6 08
8	315 53.6	−40 29.5	7 00
9	309 47.4	+49 41.4	7 24
10	291 43.1	+16 24.9	8 36
11	281 57.0	− 8 15.1	9 15
12	281 43.7	+45 57.1	9 16
13	279 22.2	+ 6 18.6	9 25
14	279 11.8	+28 34.2	9 26
15	276 33.9	− 1 13.7	9 36
16	271 52.0	+ 7 24.2	9 55
17	264 17.4	−52 39.8	10 25
18	259 15.1	−16 38.7	10 45
19	255 49.5	−28 54.1	10 59
20	245 48.7	+ 5 21.2	11 39
21	244 24.9	+28 08.9	11 45
22	234 37.9	−59 21.1	12 24
23	223 27.3	−43 14.1	13 08
24	221 51.0	−69 31.1	13 15
25	218 42.1	− 8 26.8	13 27
26	208 33.3	+12 12.4	14 08
27	194 48.8	+62 01.0	15 03
28	183 21.2	+14 50.7	15 48
29	174 02.1	−62 50.2	16 25
30	172 53.3	−56 50.8	16 30
31	168 47.2	−59 25.8	16 46
32	167 01.3	+56 13.6	16 53
33	159 30.1	+55 10.9	17 23
34	159 20.4	−10 54.6	17 24
35	153 35.3	+49 33.5	17 47
36	149 02.6	−36 08.2	18 05
37	146 38.1	+19 26.1	18 15
38	140 55.6	−60 38.7	18 37
39	137 17.0	+74 21.4	18 52
40	126 50.2	+26 52.7	19 34
41	120 37.8	−22 29.3	19 58
42	113 23.2	−26 19.8	20 27
43	109 06.5	−68 56.9	20 44
44	103 05.7	−15 40.1	21 08
45	97 24.8	−37 04.4	21 31
46	96 49.4	+12 35.6	21 33
47	91 07.3	+51 29.7	21 56
48	84 45.1	−34 24.7	22 22
49	81 10.1	+38 44.2	22 36
50	76 55.6	−26 21.6	22 53
51	62 53.3	+ 8 44.3	23 49
52	54 31.7	−56 53.5	0 26
53	50 02.9	+45 06.3	0 44
54	34 32.5	+ 9 39.1	1 46
55	28 41.5	−47 11.6	2 09
56	16 14.9	−29 52.6	2 59
57	14 24.5	+14 56.7	3 06

Lat. °	Sunrise h m	Twlt. begins h m	Moonrise 21 h m	Moonrise 22 h m	Moonrise 23 h m	Moonrise 24 h m
N 70	▭	▭	22 20	21 51	21 25	20 55
68	1 07	////	22 11	21 50	21 30	21 09
66	2 02	////	22 04	21 49	21 35	21 20
64	2 34	////	21 58	21 48	21 39	21 30
62	2 57	////	21 52	21 48	21 43	21 38
60	3 16	////	21 48	21 47	21 46	21 45
58	3 31	////	21 44	21 46	21 49	21 52
56	3 44	////	21 40	21 46	21 51	21 57
54	3 56	////	21 37	21 45	21 54	22 02
52	4 06	////	21 33	21 45	21 56	22 07
50	4 15	1 12	21 31	21 45	21 58	22 11
45	4 33	2 17	21 25	21 44	22 02	22 20
40	4 49	2 54	21 19	21 43	22 05	22 28
35	5 01	3 20	21 15	21 42	22 08	22 34
30	5 12	3 39	21 11	21 42	22 11	22 40
20	5 31	4 10	21 04	21 41	22 16	22 50
10	5 48	4 31	20 58	21 40	22 20	22 59
0	6 03	4 50	20 53	21 39	22 24	23 08
10	6 18	5 04	20 47	21 39	22 28	23 16
20	6 34	5 17	20 41	21 38	22 32	23 26
30	6 52	5 28	20 34	21 37	22 37	23 36
35	7 02	5 34	20 30	21 37	22 40	23 42
40	7 14	5 40	20 25	21 36	22 43	23 49
45	7 28	5 45	20 20	21 35	22 47	23 58
50	7 45	5 52	20 14	21 35	22 52	24 08
52	7 53	5 54	20 11	21 34	22 54	24 12
54	8 03	5 56	20 08	21 34	22 57	24 17
56	8 13	5 59	20 04	21 33	22 59	24 23
58	8 24	6 01	20 00	21 33	23 02	24 30
S 60	8 38	6 05	19 55	21 32	23 06	24 37

Lat. °	Sunset h m	Twlt. ends h m	Moonset 21 h m	Moonset 22 h m	Moonset 23 h m	Moonset 24 h m
N 70	▭	▭	6 02	8 21	10 27	12 31
68	22 58	////	6 19	8 27	10 24	12 19
66	22 07	////	6 33	8 32	10 22	12 10
64	21 36	////	6 44	8 36	10 20	12 02
62	21 13	////	6 53	8 39	10 18	11 55
60	20 55	////	7 01	8 42	10 17	11 49
58	20 40	////	7 08	8 45	10 16	11 44
56	20 27	////	7 14	8 47	10 15	11 39
54	20 16	////	7 20	8 49	10 14	11 35
52	20 06	////	7 25	8 51	10 13	11 32
50	19 57	22 56	7 29	8 53	10 12	11 28
45	19 39	21 53	7 39	8 56	10 10	11 21
40	19 24	21 18	7 47	9 00	10 09	11 15
35	19 11	20 52	7 54	9 02	10 07	11 10
30	19 00	20 32	8 00	9 05	10 06	11 06
20	18 41	20 02	8 10	9 09	10 04	10 58
10	18 25	19 41	8 19	9 12	10 02	10 51
0	18 10	19 23	8 27	9 15	10 01	10 45
10	17 55	19 09	8 35	9 18	9 59	10 38
20	17 39	18 56	8 44	9 22	9 57	10 32
30	17 21	18 45	8 53	9 25	9 55	10 24
35	17 11	18 40	8 59	9 27	9 54	10 20
40	16 59	18 34	9 05	9 30	9 53	10 15
45	16 45	18 29	9 12	9 33	9 51	10 09
50	16 28	18 23	9 21	9 36	9 49	10 03
52	16 20	18 21	9 25	9 37	9 48	9 59
54	16 11	18 18	9 29	9 39	9 48	9 56
56	16 01	18 16	9 34	9 41	9 46	9 52
58	15 49	18 13	9 39	9 43	9 45	9 48
S 60	15 36	18 11	9 45	9 45	9 44	9 43

Equation of Time (App.—Mean)

GCT h	21 m s	22 m s	23 m s
0	− 6 13.5	− 6 16.7	− 6 19.3
6	− 6 14.3	− 6 17.4	− 6 19.9
12	− 6 15.1	− 6 18.0	− 6 20.4
18	− 6 15.9	− 6 18.7	− 6 20.9
24	− 6 16.7	− 6 19.3	− 6 21.4

GCT of Transit Meridian of Greenwich

DAY	Moon h m	Venus h m	Mars h m	Jupiter h m	Saturn h m
21	2 15	14 50	10 58	5 01	16 01
22	3 04	14 49	10 57	4 57	15 58
23	3 50	14 47	10 55	4 53	15 54
24	4 34	14 45	10 54	4 49	15 50

ADDITIONAL ALTITUDE CORRECTIONS

Alt. °	Sun's Low'r Limb ′	Venus ′	Mars ′
0	0.1	0.3	0.1
30	0.1	0.2	0.0
45	0.1	0.2	0.0
60	0.1	0.1	0.0
75	0.1	0.0	0.0
90			

Moon's Lower Limb *Add*

Alt. °	21 ′	22 ′	23 ′
0	18.6	17.5	16.2
4	18.6	17.5	16.2
8	18.6	17.4	16.2
12	18.5	17.4	16.2
16	18.5	17.4	16.2
20	18.4	17.4	16.2
24	18.4	17.3	16.1
28	18.3	17.3	16.1
32	18.2	17.2	16.1
36	18.1	17.1	16.1
40	18.0	17.1	16.1
44	17.9	17.0	16.0
48	17.7	16.9	16.0
52	17.6	16.8	16.0
56	17.5	16.8	16.0
60	17.3	16.7	15.9
64	17.2	16.6	15.9
68	17.0	16.5	15.9
72	16.9	16.4	15.8
76	16.7	16.3	15.8
80	16.5	16.2	15.8
84	16.4	16.1	15.7
88	16.2	16.0	15.7
90			

Add to table, back cover

Moon's Upper Limb *Subtract*

Alt. °	21 ′	22 ′	23 ′
0	13.8	14.5	15.2
4	13.8	14.5	15.2
8	13.8	14.5	15.2
12	13.9	14.5	15.2
16	13.9	14.5	15.2
20	14.0	14.6	15.2
24	14.0	14.6	15.2
28	14.1	14.7	15.3
32	14.2	14.7	15.3
36	14.3	14.8	15.3
40	14.4	14.8	15.3
44	14.5	14.9	15.3
48	14.7	15.0	15.4
52	14.8	15.1	15.4
56	14.9	15.2	15.4
60	15.1	15.3	15.5
64	15.2	15.3	15.5
68	15.4	15.4	15.5
72	15.5	15.5	15.5
76	15.7	15.6	15.6
80	15.9	15.8	15.6
84	16.0	15.9	15.7
88	16.2	15.9	15.7
90			

Subtract from table, back cover

GCT	♈	VENUS −4.2		MARS 1.9		JUPITER −2.2		SATURN 1.3		MOON			
	GHA	GHA	Dec.	GHA	Dec.	GHA	Dec.	GHA	Dec.	GHA	code	Dec.	code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
0	300 54.6	138 31.2	+ 5 44.6	196 17.7	+23 34.0	287 30.5	+ 4 13.1	121 49.5	+ 2 49.1	293 27.7	143	+ 5 55.4	+153
1	315 57.1	153 32.4	43.6	211 18.4	33.9	302 32.9	13.1	136 51.7	49.0	308 01.0	143	6 10.7	+152
2	330 59.6	168 33.6	42.7	226 19.1	33.7	317 35.2	13.1	151 54.0	48.9	322 34.3	144	6 25.9	+152
3	346 02.0	183 34.9	·· 41.8	241 19.7	·· 33.6	332 37.6	·· 13.1	166 56.3	·· 48.8	337 07.7	143	· 6 41.1	+151
4	1 04.5	198 36.1	40.8	256 20.4	33.4	347 40.0	13.2	181 58.6	48.7	351 41.0	144	6 56.2	+151
5	16 07.0	213 37.3	39.9	271 21.1	33.3	2 42.4	13.2	197 00.8	48.6	6 14.4	143	7 11.3	+150
6	31 09.4	228 38.6	+ 5 39.0	286 21.7	+23 33.2	17 44.7	+ 4 13.2	212 03.1	+ 2 48.5	20 47.7	144	+ 7 26.3	+150
7	46 11.9	243 39.8	38.0	301 22.4	33.0	32 47.1	13.2	227 05.4	48.5	35 21.1	144	7 41.3	+149
8	61 14.3	258 41.0	37.1	316 23.1	32.9	47 49.5	13.3	242 07.7	48.4	49 54.5	144	7 56.2	+149
9	76 16.8	273 42.3	·· 36.2	331 23.7	·· 32.7	62 51.9	·· 13.3	257 09.9	·· 48.3	64 27.9	143	· 8 11.1	+148
10	91 19.3	288 43.5	35.2	346 24.4	32.6	77 54.3	13.3	272 12.2	48.2	79 01.2	144	8 25.9	+147
11	106 21.7	303 44.8	34.3	1 25.1	32.4	92 56.6	13.3	287 14.5	48.1	93 34.6	144	8 40.6	+147
12	121 24.2	318 46.0	+ 5 33.4	16 25.7	+23 32.3	107 59.0	+ 4 13.3	302 16.7	+ 2 48.0	108 08.0	144	+ 8 55.3	+147
13	136 26.7	333 47.3	32.4	31 26.4	32.1	123 01.4	13.4	317 19.0	47.9	122 41.4	144	9 10.0	+146
14	151 29.1	348 48.5	31.5	46 27.1	32.0	138 03.8	13.4	332 21.3	47.8	137 14.8	143	9 24.6	+145
15	166 31.6	3 49.8	·· 30.6	61 27.8	·· 31.8	153 06.1	·· 13.4	347 23.6	·· 47.7	151 48.1	144	· 9 39.1	+145
16	181 34.1	18 51.0	29.6	76 28.4	31.7	168 08.5	13.4	2 25.8	47.6	166 21.5	144	9 53.6	+144
17	196 36.5	33 52.3	28.7	91 29.1	31.5	183 10.9	13.5	17 28.1	47.6	180 54.9	143	10 08.0	+143
18	211 39.0	48 53.6	+ 5 27.8	106 29.8	+23 31.4	198 13.3	+ 4 13.5	32 30.4	+ 2 47.5	195 28.2	144	+10 22.3	+143
19	226 41.4	63 54.8	26.8	121 30.4	31.2	213 15.7	13.5	47 32.7	47.4	210 01.6	143	10 36.6	+142
20	241 43.9	78 56.1	25.9	136 31.1	31.1	228 18.0	13.5	62 34.9	47.3	224 34.9	144	10 50.8	+142
21	256 46.4	93 57.4	·· 25.0	151 31.8	·· 30.9	243 20.4	·· 13.5	77 37.2	·· 47.2	239 08.3	143	·11 05.0	+141
22	271 48.8	108 58.6	24.1	166 32.4	30.7	258 22.8	13.6	92 39.5	47.1	253 41.6	143	11 19.1	+140
23	286 51.3	123 59.9	23.1	181 33.1	30.6	273 25.2	13.6	107 41.7	47.0	268 14.9	143	11 33.1	+140
0	301 53.8	139 01.2	+ 5 22.2	196 33.8	+23 30.4	288 27.6	+ 4 13.6	122 44.0	+ 2 46.9	282 48.2	143	+11 47.1	+139
1	316 56.2	154 02.5	21.3	211 34.5	30.3	303 29.9	13.6	137 46.3	46.8	297 21.5	143	12 01.0	+138
2	331 58.7	169 03.7	20.4	226 35.1	30.1	318 32.3	13.7	152 48.6	46.7	311 54.8	142	12 14.8	+138
3	347 01.2	184 05.0	·· 19.4	241 35.8	·· 30.0	333 34.7	·· 13.7	167 50.8	·· 46.7	326 28.0	143	·12 28.6	+137
4	2 03.6	199 06.3	18.5	256 36.5	29.8	348 37.1	13.7	182 53.1	46.6	341 01.3	142	12 42.3	+136
5	17 06.1	214 07.6	17.6	271 37.1	29.7	3 39.5	13.7	197 55.4	46.5	355 34.5	142	12 55.9	+136
6	32 08.6	229 08.9	+ 5 16.7	286 37.8	+23 29.5	18 41.9	+ 4 13.7	212 57.6	+ 2 46.4	10 07.7	142	+13 09.5	+135
7	47 11.0	244 10.2	15.7	301 38.5	29.4	33 44.2	13.8	227 59.9	46.3	24 40.9	141	13 23.0	+134
8	62 13.5	259 11.5	14.8	316 39.2	29.2	48 46.6	13.8	243 02.2	46.2	39 14.0	142	13 36.4	+133
9	77 15.9	274 12.8	·· 13.9	331 39.8	·· 29.0	63 49.0	·· 13.8	258 04.4	·· 46.1	53 47.2	141	·13 49.7	+133
10	92 18.4	289 14.1	13.0	346 40.5	28.9	78 51.4	13.8	273 06.7	46.0	68 20.3	141	14 03.0	+132
11	107 20.9	304 15.4	12.0	1 41.2	28.7	93 53.8	13.8	288 09.0	45.9	82 53.4	140	14 16.2	+131
12	122 23.3	319 16.7	+ 5 11.1	16 41.8	+23 28.6	108 56.2	+ 4 13.9	303 11.3	+ 2 45.8	97 26.4	141	+14 29.3	+130
13	137 25.8	334 18.0	10.2	31 42.5	28.4	123 58.5	13.9	318 13.5	45.7	111 59.5	140	14 42.3	+130
14	152 28.3	349 19.3	09.3	46 43.2	28.3	139 00.9	13.9	333 15.8	45.7	126 32.5	140	14 55.3	+129
15	167 30.7	4 20.6	·· 08.4	61 43.9	·· 28.1	154 03.3	·· 13.9	348 18.1	·· 45.6	141 05.5	140	·15 08.2	+128
16	182 33.2	19 21.9	07.4	76 44.5	27.9	169 05.7	13.9	3 20.3	45.5	155 38.5	139	15 21.0	+127
17	197 35.7	34 23.2	06.5	91 45.2	27.8	184 08.1	14.0	18 22.6	45.4	170 11.4	139	15 33.7	+127
18	212 38.1	49 24.5	+ 5 05.6	106 45.9	+23 27.6	199 10.5	+ 4 14.0	33 24.9	+ 2 45.3	184 44.3	139	+15 46.4	+126
19	227 40.6	64 25.8	04.7	121 46.5	27.5	214 12.9	14.0	48 27.1	45.2	199 17.2	138	15 59.0	+125
20	242 43.0	79 27.2	03.8	136 47.2	27.3	229 15.3	14.0	63 29.4	45.1	213 50.0	138	16 11.5	+124
21	257 45.5	94 28.5	·· 02.8	151 47.9	·· 27.1	244 17.6	·· 14.0	78 31.7	·· 45.0	228 22.8	138	·16 23.9	+123
22	272 48.0	109 29.8	01.9	166 48.6	27.0	259 20.0	14.1	93 34.0	44.9	242 55.6	138	16 36.2	+122
23	287 50.4	124 31.1	01.0	181 49.2	26.8	274 22.4	14.1	108 36.2	44.8	257 28.4	137	16 48.4	+122
0	302 52.9	139 32.5	+ 5 00.1	196 49.9	+23 26.7	289 24.8	+ 4 14.1	123 38.5	+ 2 44.7	272 01.1	137	+17 00.6	+121
1	317 55.4	154 33.8	4 59.2	211 50.6	26.5	304 27.2	14.1	138 40.8	44.6	286 33.8	136	17 12.7	+120
2	332 57.8	169 35.1	58.3	226 51.3	26.3	319 29.6	14.1	153 43.0	44.6	301 06.4	136	17 24.7	+119
3	348 00.3	184 36.5	·· 57.3	241 51.9	·· 26.2	334 32.0	·· 14.1	168 45.3	·· 44.5	315 39.0	136	·17 36.6	+118
4	3 02.8	199 37.8	56.4	256 52.6	26.0	349 34.4	14.2	183 47.6	44.4	330 11.6	135	17 48.4	+118
5	18 05.2	214 39.2	55.5	271 53.3	25.9	4 36.8	14.2	198 49.8	44.3	344 44.1	135	18 00.2	+116
6	33 07.7	229 40.5	+ 4 54.6	286 54.0	+23 25.7	19 39.1	+ 4 14.2	213 52.1	+ 2 44.2	359 16.6	135	+18 11.8	+116
7	48 10.2	244 41.8	53.7	301 54.6	25.5	34 41.5	14.2	228 54.4	44.1	13 49.1	134	18 23.4	+114
8	63 12.6	259 43.2	52.8	316 55.3	25.4	49 43.9	14.2	243 56.6	44.0	28 21.5	134	18 34.8	+114
9	78 15.1	274 44.5	·· 51.9	331 56.0	·· 25.2	64 46.3	·· 14.3	258 58.9	·· 43.9	42 53.9	133	·18 46.2	+113
10	93 17.5	289 45.9	51.0	346 56.7	25.0	79 48.7	14.3	274 01.2	43.8	57 26.2	133	18 57.5	+112
11	108 20.0	304 47.3	50.0	1 57.3	24.9	94 51.1	14.3	289 03.4	43.7	71 58.5	133	19 08.7	+111
12	123 22.5	319 48.6	+ 4 49.1	16 58.0	+23 24.7	109 53.5	+ 4 14.3	304 05.7	+ 2 43.6	86 30.8	132	+19 19.8	+110
13	138 24.9	334 50.0	48.2	31 58.7	24.5	124 55.9	14.3	319 08.0	43.5	101 03.0	132	19 30.8	+110
14	153 27.4	349 51.3	47.3	46 59.4	24.4	139 58.3	14.3	334 10.2	43.5	115 35.2	131	19 41.8	+108
15	168 29.9	4 52.7	·· 46.4	62 00.0	·· 24.2	155 00.7	·· 14.4	349 12.5	·· 43.4	130 07.3	131	·19 52.6	+107
16	183 32.3	19 54.1	45.5	77 00.7	24.0	170 03.1	14.4	4 14.8	43.3	144 39.4	130	20 03.3	+106
17	198 34.8	34 55.4	44.6	92 01.4	23.9	185 05.5	14.4	19 17.0	43.2	159 11.4	130	20 13.9	+106
18	213 37.3	49 56.8	+ 4 43.7	107 02.1	+23 23.7	200 07.9	+ 4 14.4	34 19.3	+ 2 43.1	173 43.4	130	+20 24.5	+104
19	228 39.7	64 58.2	42.8	122 02.7	23.5	215 10.3	14.4	49 21.6	43.0	188 15.4	129	20 34.9	+104
20	243 42.2	79 59.6	41.9	137 03.4	23.4	230 12.6	14.4	64 23.8	42.9	202 47.3	129	20 45.3	+102
21	258 44.7	95 00.9	·· 41.0	152 04.1	·· 23.2	245 15.0	·· 14.5	79 26.1	·· 42.8	217 19.2	128	·20 55.5	+102
22	273 47.1	110 02.3	40.1	167 04.8	23.0	260 17.4	14.5	94 28.4	42.7	231 51.0	128	21 05.7	+100
23	288 49.6	125 03.7	39.2	182 05.5	22.9	275 19.8	14.5	109 30.6	42.6	246 22.8	127	21 15.7	+100
24	303 52.0	140 05.1	+ 4 38.3	197 06.1	+23 22.7	290 22.2	+ 4 14.5	124 32.9	+ 2 42.5	260 54.5	127	+21 25.7	+ 98
code	—	+ 13	− 9	+ 7	− 2	+ 23	0	+ 22	− 1				

GCT	SUN GHA	SUN Dec.
h	° ′	° ′
0	178 24.6	+20 05.6
1	193 24.6	05.1
2	208 24.6	04.6
3	223 24.6 ··	04.1
4	238 24.6	03.5
5	253 24.6	03.0
6	268 24.5	+20 02.5
7	283 24.5	02.0
8	298 24.5	01.5
9	313 24.5 ··	01.0
10	328 24.5	20 00.5
11	343 24.5	19 59.9
12	358 24.4	+19 59.4
13	13 24.4	58.9
14	28 24.4	58.4
15	43 24.4 ··	57.9
16	58 24.4	57.3
17	73 24.4	56.8
18	88 24.4	+19 56.3
19	103 24.3	55.8
20	118 24.3	55.3
21	133 24.3 ··	54.7
22	148 24.3	54.2
23	163 24.3	53.7
0	178 24.3	+19 53.2
1	193 24.3	52.6
2	208 24.2	52.1
3	223 24.2 ··	51.6
4	238 24.2	51.1
5	253 24.2	50.5
6	268 24.2	+19 50.0
7	283 24.2	49.5
8	298 24.2	49.0
9	313 24.2 ··	48.4
10	328 24.2	47.9
11	343 24.1	47.4
12	358 24.1	+19 46.8
13	13 24.1	46.3
14	28 24.1	45.8
15	43 24.1 ··	45.2
16	58 24.1	44.7
17	73 24.1	44.2
18	88 24.1	+19 43.6
19	103 24.1	43.1
20	118 24.1	42.6
21	133 24.1 ··	42.0
22	148 24.0	41.5
23	163 24.0	41.0
0	178 24.0	+19 40.4
1	193 24.0	39.9
2	208 24.0	39.4
3	223 24.0 ··	38.8
4	238 24.0	38.3
5	253 24.0	37.7
6	268 24.0	+19 37.2
7	283 24.0	36.6
8	298 24.0	36.1
9	313 24.0 ··	35.6
10	328 24.0	35.0
11	343 24.0	34.5
12	358 24.0	+19 33.9
13	13 24.0	33.4
14	28 24.0	32.8
15	43 24.0 ··	32.3
16	58 24.0	31.7
17	73 24.0	31.2
18	88 24.0	+19 30.7
19	103 23.9	30.1
20	118 23.9	29.6
21	133 23.9 ··	29.0
22	148 23.9	28.5
23	163 23.9	27.9
24	178 23.9	+19 27.4
code	—	− 5

STARS No.	SHA	Dec.	Transit Mer. Gr.
	° ′	° ′	h m
1	358 31.6	+28 49.4	3 58
2	358 21.1	+58 52.8	3 58
3	349 42.4	−18 14.9	4 33
4	339 20.6	+59 58.9	5 14
5	336 01.0	−57 28.5	5 27
6	332 37.9	+89 02.0	5 41
7	328 53.4	+23 14.1	5 56
8	315 53.6	−40 29.5	6 48
9	309 47.4	+49 41.4	7 12
10	291 43.1	+16 25.0	8 24
11	281 57.0	− 8 15.1	9 03
12	281 43.7	+45 57.1	9 04
13	279 22.2	+ 6 18.6	9 13
14	279 11.8	+28 34.2	9 14
15	276 33.9	− 1 13.7	9 25
16	271 52.0	+ 7 24.2	9 43
17	264 17.3	−52 39.8	10 14
18	259 15.1	−16 38.7	10 34
19	255 49.5	−28 54.1	10 47
20	245 48.7	+ 5 21.2	11 27
21	244 24.9	+28 08.9	11 33
22	234 37.9	−59 21.1	12 12
23	223 27.3	−43 14.1	12 56
24	221 51.0	−69 31.1	13 03
25	218 42.1	− 8 26.8	13 15
26	208 33.3	+12 12.4	13 56
27	194 48.8	+62 01.0	14 51
28	183 21.2	+14 50.7	15 36
29	174 02.1	−62 50.2	16 14
30	172 53.4	−56 50.8	16 18
31	168 47.2	−59 25.8	16 35
32	167 01.3	+56 13.6	16 42
33	159 30.2	+55 10.9	17 12
34	159 20.4	−10 54.6	17 12
35	153 35.3	+49 33.5	17 35
36	149 02.6	−36 08.2	17 53
37	146 38.1	+19 26.1	18 03
38	140 55.6	−60 38.7	18 26
39	137 17.0	+74 21.4	18 40
40	126 50.2	+26 52.7	19 22
41	120 37.8	−22 29.3	19 47
42	113 23.2	−26 19.8	20 16
43	109 06.6	−68 56.9	20 33
44	103 05.7	−15 40.1	20 57
45	97 24.8	−37 04.4	21 19
46	96 49.4	+12 35.6	21 22
47	91 07.3	+51 29.7	21 44
48	84 45.1	−34 24.7	22 10
49	81 10.1	+38 44.3	22 24
50	76 55.6	−26 21.6	22 41
51	62 53.3	+ 8 44.3	23 37
52	54 31.7	−56 53.6	0 14
53	50 02.9	+45 06.3	0 32
54	34 32.5	+ 9 39.1	1 34
55	28 41.5	−47 11.6	1 57
56	16 14.9	−29 52.6	2 47
57	14 24.5	+14 56.7	2 54

Lat.	Sunrise	Twlt. begins	Moonrise 24	25	26	27
N °	h m	h m	h m	h m	h m	h m
70	□	□	20 55	20 15	□	□
68	1 30	////	21 09	20 42	19 53	□
66	2 14	////	21 20	21 03	20 36	□
64	2 43	////	21 30	21 19	21 06	20 43
62	3 05	////	21 38	21 33	21 28	21 22
60	3 23	////	21 45	21 45	21 46	21 50
58	3 37	////	21 52	21 55	22 01	22 11
56	3 50	////	21 57	22 04	22 14	22 29
54	4 00	////	22 02	22 12	22 25	22 44
52	4 10	0 27	22 07	22 20	22 35	22 57
50	4 19	1 24	22 11	22 26	22 45	23 08
45	4 37	2 23	22 20	22 40	23 04	23 32
40	4 51	2 57	22 28	22 52	23 19	23 51
35	5 03	3 23	22 34	23 02	23 33	24 08
30	5 14	3 42	22 40	23 11	23 44	24 22
20	5 32	4 11	22 50	23 26	24 04	0 04
10	5 48	4 32	22 59	23 39	24 22	0 22
0	6 03	4 50	23 08	23 52	24 38	0 38
10	6 17	5 04	23 16	24 05	0 05	0 54
20	6 33	5 16	23 26	24 19	0 19	1 12
30	6 50	5 28	23 36	24 35	0 35	1 33
35	7 00	5 33	23 42	24 44	0 44	1 45
40	7 12	5 38	23 49	24 54	0 54	1 59
45	7 26	5 43	23 58	25 07	1 07	2 16
50	7 42	5 48	24 08	0 08	1 22	2 36
52	7 50	5 51	24 12	0 12	1 30	2 46
54	7 58	5 53	24 17	0 17	1 38	2 57
56	8 08	5 55	24 23	0 23	1 47	3 10
58	8 19	5 58	24 30	0 30	1 57	3 25
60	8 32	6 00	24 37	0 37	2 09	3 43
S						

Lat.	Sunset	Twlt. ends	Moonset 24	25	26	27
N °	h m	h m	h m	h m	h m	h m
70	□	□	12 31	14 44	□	□
68	22 37	////	12 19	14 19	16 42	□
66	21 55	////	12 10	14 00	16 00	□
64	21 27	////	12 02	13 44	15 32	17 32
62	21 06	////	11 55	13 31	15 10	16 54
60	20 49	////	11 49	13 20	14 53	16 27
58	20 34	////	11 44	13 11	14 39	16 06
56	20 22	////	11 39	13 03	14 26	15 49
54	20 11	////	11 35	12 56	14 16	15 35
52	20 02	23 34	11 32	12 49	14 06	15 22
50	19 53	22 44	11 28	12 43	13 58	15 11
45	19 36	21 48	11 21	12 31	13 40	14 48
40	19 21	21 13	11 15	12 21	13 26	14 30
35	19 09	20 49	11 10	12 12	13 13	14 14
30	18 58	20 29	11 06	12 04	13 03	14 01
20	18 40	20 01	10 58	11 51	12 44	13 38
10	18 25	19 40	10 51	11 40	12 29	13 19
0	18 10	19 23	10 45	11 29	12 14	13 01
10	17 56	19 10	10 38	11 18	11 59	12 43
20	17 40	18 57	10 32	11 07	11 44	12 23
30	17 23	18 46	10 24	10 54	11 26	12 01
35	17 13	18 41	10 20	10 47	11 16	11 48
40	17 01	18 36	10 15	10 38	11 04	11 33
45	16 48	18 31	10 09	10 28	10 50	11 16
50	16 31	18 25	10 03	10 17	10 33	10 54
52	16 24	18 24	9 59	10 11	10 25	10 44
54	16 15	18 21	9 56	10 05	10 17	10 32
56	16 06	18 20	9 52	9 59	10 07	10 19
58	15 55	18 18	9 48	9 51	9 56	10 03
60	15 42	18 15	9 43	9 43	9 43	9 45
S						

GCT	Equation of Time (App.—Mean) 24	25	26
h	m s	m s	m s
0	− 6 21.4	− 6 22.9	− 6 23.9
6	− 6 21.8	− 6 23.2	− 6 24.0
12	− 6 22.2	− 6 23.4	− 6 24.1
18	− 6 22.6	− 6 23.7	− 6 24.2
24	− 6 22.9	− 6 23.9	− 6 24.2

GCT of Transit Meridian of Greenwich

DAY	Moon	Venus	Mars	Jupiter	Saturn
	h m	h m	h m	h m	h m
24	4 34	14 45	10 54	4 49	15 50
25	5 18	14 43	10 53	4 45	15 47
26	6 03	14 41	10 52	4 42	15 43
27	6 49	14 38	10 51	4 38	15 39

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb	Venus	Mars
°	′	′	′
0			
	0.1	0.3	0.1
30			
	0.1	0.2	0.0
45			
	0.1	0.2	0.0
60			
	0.1	0.1	0.0
75			
	0.1	0.0	0.0
90			

Moon's Lower Limb *Add*

Alt.	24	25	26
°	′	′	′
0			
	15.0	14.0	13.3
4			
	15.0	14.0	13.3
8			
	15.0	14.0	13.3
12			
	15.1	14.1	13.3
16			
	15.1	14.1	13.3
20			
	15.1	14.1	13.4
24			
	15.1	14.1	13.4
28			
	15.1	14.2	13.5
32			
	15.1	14.2	13.6
36			
	15.1	14.3	13.6
40			
	15.1	14.3	13.7
44			
	15.2	14.4	13.8
48			
	15.2	14.5	13.9
52			
	15.2	14.5	14.0
56			
	15.2	14.6	14.1
60			
	15.3	14.7	14.2
64			
	15.3	14.7	14.3
68			
	15.3	14.8	14.4
72			
	15.3	14.9	14.6
76			
	15.4	15.0	14.7
80			
	15.4	15.1	14.8
84			
	15.4	15.1	14.9
88			
	15.4	15.2	15.0
90			

Add to table, back cover

Moon's Upper Limb *Subtract*

Alt.	24	25	26
°	′	′	′
0			
	15.8	16.4	16.9
4			
	15.8	16.4	16.8
8			
	15.8	16.4	16.8
12			
	15.8	16.4	16.8
16			
	15.8	16.4	16.8
20			
	15.8	16.3	16.7
24			
	15.8	16.3	16.7
28			
	15.8	16.3	16.6
32			
	15.8	16.2	16.6
36			
	15.8	16.2	16.5
40			
	15.7	16.1	16.4
44			
	15.7	16.1	16.3
48			
	15.7	16.0	16.2
52			
	15.7	15.9	16.1
56			
	15.7	15.9	16.0
60			
	15.6	15.8	15.9
64			
	15.6	15.7	15.8
68			
	15.6	15.6	15.7
72			
	15.6	15.6	15.6
76			
	15.5	15.5	15.4
80			
	15.5	15.4	15.3
84			
	15.5	15.3	15.2
88			
	15.4	15.2	15.1
90			

Subtract from table, back cover

Last Quarter 25

GCT	♈ GHA	VENUS −4.2 GHA	VENUS Dec.	MARS 1.9 GHA	MARS Dec.	JUPITER −2.2 GHA	JUPITER Dec.	SATURN 1.3 GHA	SATURN Dec.	MOON GHA	code	MOON Dec.	code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
0	303 52.0	140 05.1	+ 4 38.3	197 06.1	+23 22.7	290 22.2	+ 4 14.5	124 32.9	+ 2 42.5	260 54.5	127	+21 25.7	+ 98
1	318 54.5	155 06.5	37.4	212 06.8	22.5	305 24.6	14.5	139 35.2	42.4	275 26.2	126	21 35.5	+ 98
2	333 57.0	170 07.9	36.5	227 07.5	22.4	320 27.0	14.5	154 37.4	42.3	289 57.8	126	21 45.3	+ 96
3	348 59.4	185 09.3	·· 35.6	242 08.2	·· 22.2	335 29.4	·· 14.5	169 39.7	·· 42.3	304 29.4	125	·21 54.9	+ 96
4	4 01.9	200 10.7	34.6	257 08.8	22.0	350 31.8	14.6	184 42.0	42.2	319 00.9	125	22 04.5	+ 94
5	19 04.4	215 12.1	33.7	272 09.5	21.8	5 34.2	14.6	199 44.2	42.1	333 32.4	124	22 13.9	+ 93
6	34 06.8	230 13.5	+ 4 32.8	287 10.2	+23 21.7	20 36.6	+ 4 14.6	214 46.5	+ 2 42.0	348 03.8	124	+22 23.2	+ 93
7	49 09.3	245 14.9	31.9	302 10.9	21.5	35 39.0	14.6	229 48.8	41.9	2 35.2	124	22 32.5	+ 91
8	64 11.8	260 16.3	31.0	317 11.6	21.3	50 41.4	14.6	244 51.0	41.8	17 06.6	123	22 41.6	+ 90
9	79 14.2	275 17.7	·· 30.2	332 12.2	·· 21.2	65 43.8	·· 14.6	259 53.3	·· 41.7	31 37.9	122	·22 50.6	+ 89
10	94 16.7	290 19.1	29.3	347 12.9	21.0	80 46.2	14.6	274 55.6	41.6	46 09.1	122	22 59.5	+ 88
11	109 19.2	305 20.5	28.4	2 13.6	20.8	95 48.6	14.7	289 57.8	41.5	60 40.3	122	23 08.3	+ 87
12	124 21.6	320 21.9	+ 4 27.5	17 14.3	+23 20.6	110 51.0	+ 4 14.7	305 00.1	+ 2 41.4	75 11.5	121	+23 17.0	+ 86
13	139 24.1	335 23.3	26.6	32 15.0	20.5	125 53.4	14.7	320 02.4	41.3	89 42.6	120	23 25.6	+ 84
14	154 26.5	350 24.8	25.7	47 15.6	20.3	140 55.8	14.7	335 04.6	41.2	104 13.6	120	23 34.0	+ 84
15	169 29.0	5 26.2	·· 24.8	62 16.3	·· 20.1	155 58.2	·· 14.7	350 06.9	·· 41.1	118 44.6	120	·23 42.4	+ 83
16	184 31.5	20 27.6	23.9	77 17.0	19.9	171 00.6	14.7	5 09.2	41.0	133 15.6	119	23 50.7	+ 81
17	199 33.9	35 29.0	23.0	92 17.7	19.8	186 03.0	14.7	20 11.4	41.0	147 46.5	119	23 58.8	+ 80
18	214 36.4	50 30.5	+ 4 22.1	107 18.4	+23 19.6	201 05.4	+ 4 14.8	35 13.7	+ 2 40.9	162 17.4	118	+24 06.8	+ 79
19	229 38.9	65 31.9	21.2	122 19.0	19.4	216 07.8	14.8	50 16.0	40.8	176 48.2	117	24 14.7	+ 78
20	244 41.3	80 33.3	20.3	137 19.7	19.2	231 10.2	14.8	65 18.2	40.7	191 18.9	117	24 22.5	+ 77
21	259 43.8	95 34.8	·· 19.4	152 20.4	·· 19.1	246 12.6	·· 14.8	80 20.5	·· 40.6	205 49.6	117	·24 30.2	+ 76
22	274 46.3	110 36.2	18.5	167 21.1	18.9	261 15.0	14.8	95 22.7	40.5	220 20.3	116	24 37.8	+ 75
23	289 48.7	125 37.7	17.6	182 21.8	18.7	276 17.4	14.8	110 25.0	40.4	234 50.9	116	24 45.3	+ 73
0	304 51.2	140 39.1	+ 4 16.7	197 22.4	+23 18.5	291 19.8	+ 4 14.8	125 27.3	+ 2 40.3	249 21.5	115	+24 52.6	+ 72
1	319 53.6	155 40.5	15.8	212 23.1	18.4	306 22.2	14.8	140 29.5	40.2	263 52.0	115	24 59.8	+ 71
2	334 56.1	170 42.0	15.0	227 23.8	18.2	321 24.6	14.9	155 31.8	40.1	278 22.5	114	25 06.9	+ 70
3	349 58.6	185 43.4	·· 14.1	242 24.5	·· 18.0	336 27.0	·· 14.9	170 34.1	·· 40.0	292 52.9	114	·25 13.9	+ 69
4	5 01.0	200 44.9	13.2	257 25.2	17.8	351 29.5	14.9	185 36.3	39.9	307 23.3	113	25 20.8	+ 67
5	20 03.5	215 46.4	12.3	272 25.8	17.7	6 31.9	14.9	200 38.6	39.8	321 53.6	113	25 27.5	+ 67
6	35 06.0	230 47.8	+ 4 11.4	287 26.5	+23 17.5	21 34.3	+ 4 14.9	215 40.9	+ 2 39.7	336 23.9	113	+25 34.2	+ 65
7	50 08.4	245 49.3	10.5	302 27.2	17.3	36 36.7	14.9	230 43.1	39.6	350 54.2	112	25 40.7	+ 64
8	65 10.9	260 50.7	09.6	317 27.9	17.1	51 39.1	14.9	245 45.4	39.6	5 24.4	111	25 47.1	+ 63
9	80 13.4	275 52.2	·· 08.7	332 28.6	·· 16.9	66 41.5	·· 14.9	260 47.6	·· 39.5	19 54.5	111	·25 53.4	+ 61
10	95 15.8	290 53.7	07.9	347 29.3	16.8	81 43.9	14.9	275 49.9	39.4	34 24.6	111	25 59.5	+ 60
11	110 18.3	305 55.2	07.0	2 29.9	16.6	96 46.3	15.0	290 52.2	39.3	48 54.7	110	26 05.5	+ 59
12	125 20.8	320 56.6	+ 4 06.1	17 30.6	+23 16.4	111 48.7	+ 4 15.0	305 54.4	+ 2 39.2	63 24.7	110	+26 11.4	+ 58
13	140 23.2	335 58.1	05.2	32 31.3	16.2	126 51.1	15.0	320 56.7	39.1	77 54.7	110	26 17.2	+ 57
14	155 25.7	350 59.6	04.3	47 32.0	16.0	141 53.5	15.0	335 59.0	39.0	92 24.7	109	26 22.9	+ 55
15	170 28.1	6 01.1	·· 03.4	62 32.7	·· 15.9	156 55.9	·· 15.0	351 01.2	·· 38.9	106 54.6	108	·26 28.4	+ 54
16	185 30.6	21 02.6	02.6	77 33.4	15.7	171 58.3	15.0	6 03.5	38.8	121 24.4	108	26 33.8	+ 53
17	200 33.1	36 04.0	01.7	92 34.0	15.5	187 00.7	15.0	21 05.7	38.7	135 54.2	108	26 39.1	+ 51
18	215 35.5	51 05.5	+ 4 00.8	107 34.7	+23 15.3	202 03.2	+ 4 15.0	36 08.0	+ 2 38.6	150 24.0	107	+26 44.2	+ 50
19	230 38.0	66 07.0	3 59.9	122 35.4	15.1	217 05.6	15.0	51 10.3	38.5	164 53.7	107	26 49.2	+ 49
20	245 40.5	81 08.5	59.0	137 36.1	14.9	232 08.0	15.0	66 12.5	38.4	179 23.4	107	26 54.1	+ 48
21	260 42.9	96 10.0	·· 58.2	152 36.8	·· 14.8	247 10.4	·· 15.1	81 14.8	·· 38.3	193 53.1	106	·26 58.9	+ 47
22	275 45.4	111 11.5	57.3	167 37.5	14.6	262 12.8	15.1	96 17.1	38.2	208 22.7	106	27 03.6	+ 45
23	290 47.9	126 13.0	56.4	182 38.1	14.4	277 15.2	15.1	111 19.3	38.1	222 52.3	105	27 08.1	+ 44
0	305 50.3	141 14.5	+ 3 55.5	197 38.8	+23 14.2	292 17.6	+ 4 15.1	126 21.6	+ 2 38.0	237 21.8	106	+27 12.5	+ 42
1	320 52.8	156 16.0	54.7	212 39.5	14.0	307 20.0	15.1	141 23.8	37.9	251 51.4	104	27 16.7	+ 41
2	335 55.3	171 17.5	53.8	227 40.2	13.8	322 22.4	15.1	156 26.1	37.9	266 20.8	105	27 20.8	+ 40
3	350 57.7	186 19.0	·· 52.9	242 40.9	·· 13.6	337 24.9	·· 15.1	171 28.4	·· 37.8	280 50.3	104	·27 24.8	+ 39
4	6 00.2	201 20.6	52.0	257 41.6	13.5	352 27.3	15.1	186 30.6	37.7	295 19.7	104	27 28.7	+ 37
5	21 02.6	216 22.1	51.2	272 42.3	13.3	7 29.7	15.1	201 32.9	37.6	309 49.1	103	27 32.4	+ 36
6	36 05.1	231 23.6	+ 3 50.3	287 42.9	+23 13.1	22 32.1	+ 4 15.1	216 35.1	+ 2 37.5	324 18.4	104	+27 36.0	+ 35
7	51 07.6	246 25.1	49.4	302 43.6	12.9	37 34.5	15.1	231 37.4	37.4	338 47.8	102	27 39.5	+ 33
8	66 10.0	261 26.6	48.5	317 44.3	12.7	52 36.9	15.1	246 39.7	37.3	353 17.0	103	27 42.8	+ 33
9	81 12.5	276 28.2	·· 47.7	332 45.0	·· 12.5	67 39.3	·· 15.2	261 41.9	·· 37.2	7 46.3	103	·27 46.1	+ 30
10	96 15.0	291 29.7	46.8	347 45.7	12.3	82 41.7	15.2	276 44.2	37.1	22 15.6	102	27 49.1	+ 30
11	111 17.4	306 31.2	45.9	2 46.4	12.2	97 44.2	15.2	291 46.4	37.0	36 44.8	102	27 52.1	+ 28
12	126 19.9	321 32.8	+ 3 45.1	17 47.1	+23 12.0	112 46.6	+ 4 15.2	306 48.7	+ 2 36.9	51 14.0	101	+27 54.9	+ 26
13	141 22.4	336 34.3	44.2	32 47.7	11.8	127 49.0	15.2	321 51.0	36.8	65 43.1	102	27 57.5	+ 26
14	156 24.8	351 35.8	43.3	47 48.4	11.6	142 51.4	15.2	336 53.2	36.7	80 12.3	101	28 00.1	+ 24
15	171 27.3	6 37.4	·· 42.5	62 49.1	·· 11.4	157 53.8	·· 15.2	351 55.5	·· 36.6	94 41.4	101	·28 02.5	+ 23
16	186 29.7	21 38.9	41.6	77 49.8	11.2	172 56.2	15.2	6 57.7	36.5	109 10.5	100	28 04.8	+ 21
17	201 32.2	36 40.5	40.7	92 50.5	11.0	187 58.7	15.2	22 00.0	36.4	123 39.5	101	28 06.9	+ 20
18	216 34.7	51 42.0	+ 3 39.9	107 51.2	+23 10.8	203 01.1	+ 4 15.2	37 02.3	+ 2 36.3	138 08.6	100	+28 08.9	+ 19
19	231 37.1	66 43.6	39.0	122 51.9	10.6	218 03.5	15.2	52 04.5	36.2	152 37.6	101	28 10.8	+ 17
20	246 39.6	81 45.1	38.1	137 52.6	10.4	233 05.9	15.2	67 06.8	36.1	167 06.7	100	28 12.5	+ 16
21	261 42.1	96 46.7	·· 37.3	152 53.2	·· 10.3	248 08.3	·· 15.2	82 09.0	·· 36.1	181 35.7	100	·28 14.1	+ 14
22	276 44.5	111 48.3	36.4	167 53.9	10.1	263 10.7	15.2	97 11.3	36.0	196 04.7	99	28 15.5	+ 13
23	291 47.0	126 49.8	35.6	182 54.6	09.9	278 13.2	15.3	112 13.6	35.9	210 33.6	100	28 16.8	+ 12
24	306 49.5	141 51.4	+ 3 34.7	197 55.3	+23 09.7	293 15.6	+ 4 15.3	127 15.8	+ 2 35.8	225 02.6	100	+28 18.0	+ 11
code	—	+ 15	− 9	+ 7	− 2	+ 24	0	+ 23	− 1				

GCT	SUN GHA		Dec.
h	° ′		° ′
0	178 23.9	+19	27.4
1	193 23.9		26.8
2	208 23.9		26.2
3	223 23.9	••	25.7
4	238 23.9		25.1
5	253 23.9		24.6
6	268 23.9	+19	24.0
7	283 23.9		23.5
8	298 23.9		22.9
9	313 23.9	••	22.4
10	328 23.9		21.8
11	343 23.9		21.3
12	358 24.0	+19	20.7
13	13 24.0		20.1
14	28 24.0		19.6
15	43 24.0	••	19.0
16	58 24.0		18.5
17	73 24.0		17.9
18	88 24.0	+19	17.3
19	103 24.0		16.8
20	118 24.0		16.2
21	133 24.0	••	15.6
22	148 24.0		15.1
23	163 24.0		14.5
0	178 24.0	+19	14.0
1	193 24.0		13.4
2	208 24.0		12.8
3	223 24.0	••	12.3
4	238 24.0		11.7
5	253 24.0		11.1
6	268 24.0	+19	10.6
7	283 24.0		10.0
8	298 24.0		09.4
9	313 24.1	••	08.8
10	328 24.1		08.3
11	343 24.1		07.7
12	358 24.1	+19	07.1
13	13 24.1		06.6
14	28 24.1		06.0
15	43 24.1	••	05.4
16	58 24.1		04.8
17	73 24.1		04.3
18	88 24.1	+19	03.7
19	103 24.1		03.1
20	118 24.1		02.5
21	133 24.2	••	02.0
22	148 24.2		01.4
23	163 24.2		00.8
0	178 24.2	+19	00.2
1	193 24.2	18	59.7
2	208 24.2		59.1
3	223 24.2	••	58.5
4	238 24.2		57.9
5	253 24.3		57.3
6	268 24.3	+18	56.8
7	283 24.3		56.2
8	298 24.3		55.6
9	313 24.3	••	55.0
10	328 24.3		54.4
11	343 24.3		53.8
12	358 24.3	+18	53.3
13	13 24.4		52.7
14	28 24.4		52.1
15	43 24.4	••	51.5
16	58 24.4		50.9
17	73 24.4		50.3
18	88 24.4	+18	49.7
19	103 24.5		49.2
20	118 24.5		48.6
21	133 24.5	••	48.0
22	148 24.5		47.4
23	163 24.5		46.8
24	178 24.5	+18	46.2
code	—		− 5

STARS No.	SHA	Dec.	Transit Mer. Gr.
	° ′	° ′	h m
1	358 31.6	+28 49.4	3 46
2	358 21.1	+58 52.8	3 47
3	349 42.3	−18 14.9	4 21
4	339 20.6	+59 58.9	5 02
5	336 00.9	−57 28.5	5 16
6	332 36.9	+89 02.0	5 29
7	328 53.4	+23 14.1	5 44
8	315 53.6	−40 29.5	6 36
9	309 47.3	+49 41.4	7 00
10	291 43.0	+16 25.0	8 12
11	281 57.0	− 8 15.1	8 51
12	281 43.6	+45 57.1	8 52
13	279 22.2	+ 6 18.6	9 02
14	279 11.8	+28 34.2	9 02
15	276 33.8	− 1 13.6	9 13
16	271 51.9	+ 7 24.2	9 32
17	264 17.3	−52 39.8	10 02
18	259 15.0	−16 38.6	10 22
19	255 49.5	−28 54.1	10 36
20	245 48.7	+ 5 21.2	11 15
21	244 24.9	+28 08.8	11 21
22	234 37.9	−59 21.1	12 00
23	223 27.3	−43 14.1	12 45
24	221 51.0	−69 31.0	12 51
25	218 42.1	− 8 26.8	13 04
26	208 33.3	+12 12.4	13 44
27	194 48.8	+62 01.0	14 39
28	183 21.2	+14 50.7	15 25
29	174 02.1	−62 50.1	16 02
30	172 53.4	−56 50.8	16 06
31	168 47.2	−59 25.7	16 23
32	167 01.4	+56 13.6	16 30
33	159 30.2	+55 10.9	17 00
34	159 20.4	−10 54.6	17 00
35	153 35.3	+49 33.5	17 23
36	149 02.6	−36 08.2	17 42
37	146 38.1	+19 26.1	17 51
38	140 55.6	−60 38.7	18 14
39	137 17.1	+74 21.4	18 28
40	126 50.2	+26 52.7	19 10
41	120 37.8	−22 29.3	19 35
42	113 23.2	−26 19.8	20 04
43	109 06.6	−68 56.9	20 21
44	103 05.7	−15 40.1	20 45
45	97 24.8	−37 04.4	21 07
46	96 49.4	+12 35.6	21 10
47	91 07.3	+51 29.7	21 33
48	84 45.1	−34 24.7	21 58
49	81 10.1	+38 44.3	22 12
50	76 55.6	−26 21.6	22 29
51	62 53.3	+ 8 44.3	23 25
52	54 31.7	−56 53.6	0 02
53	50 02.9	+45 06.3	0 20
54	34 32.5	+ 9 39.1	1 22
55	28 41.5	−47 11.6	1 46
56	16 14.8	−29 52.6	2 35
57	14 24.5	+14 56.7	2 43

Lat.	Sunrise	Twlt. begins	Moonrise 27	28	29	30
N °	h m	h m	h m	h m	h m	h m
70	▭	▭	▭	▭	▭	▭
68	1 49	////	▭	▭	▭	▭
66	2 26	////	▭	▭	▭	▭
64	2 53	////	20 43	▭	▭	▭
62	3 13	////	21 22	21 14	▭	▭
60	3 29	////	21 50	21 59	22 24	23 19
58	3 43	////	22 11	22 29	23 02	23 56
56	3 55	////	22 29	22 52	23 28	24 22
54	4 05	////	22 44	23 10	23 49	24 43
52	4 14	0 54	22 57	23 26	24 07	0 07
50	4 23	1 35	23 08	23 40	24 22	0 22
45	4 40	2 29	23 32	24 08	0 08	0 52
40	4 54	3 02	23 51	24 30	0 30	1 16
35	5 06	3 26	24 08	0 08	0 48	1 35
30	5 16	3 44	24 22	0 22	1 04	1 52
20	5 34	4 13	0 04	0 46	1 31	2 20
10	5 49	4 34	0 22	1 06	1 54	2 44
0	6 03	4 50	0 38	1 26	2 16	3 07
10	6 17	5 04	0 54	1 45	2 37	3 29
20	6 32	5 15	1 12	2 07	3 01	3 54
30	6 49	5 26	1 33	2 31	3 28	4 22
35	6 58	5 31	1 45	2 45	3 44	4 39
40	7 09	5 36	1 59	3 02	4 03	4 58
45	7 22	5 40	2 16	3 23	4 26	5 22
50	7 38	5 45	2 36	3 48	4 55	5 53
52	7 45	5 48	2 46	4 01	5 10	6 08
54	7 54	5 49	2 57	4 15	5 26	6 26
56	8 03	5 52	3 10	4 32	5 47	6 48
58	8 13	5 53	3 25	4 52	6 12	7 16
60	8 25	5 55	3 43	5 17	6 47	7 56
S						

Lat.	Sunset	Twlt. ends	Moonset 27	28	29	30
N °	h m	h m	h m	h m	h m	h m
70	23 33	▭	▭	▭	▭	▭
68	22 19	////	▭	▭	▭	▭
66	21 43	////	▭	▭	▭	▭
64	21 18	////	17 32	▭	▭	▭
62	20 58	////	16 54	18 44	▭	▭
60	20 42	////	16 27	18 00	19 21	20 13
58	20 28	////	16 06	17 31	18 43	19 36
56	20 17	////	15 49	17 08	18 17	19 09
54	20 06	////	15 35	16 50	17 56	18 48
52	19 58	23 12	15 22	16 34	17 38	18 31
50	19 49	22 33	15 11	16 21	17 24	18 16
45	19 32	21 41	14 48	15 53	16 54	17 46
40	19 18	21 09	14 30	15 32	16 30	17 23
35	19 07	20 46	14 14	15 14	16 11	17 03
30	18 57	20 28	14 01	14 59	15 54	16 46
20	18 39	19 59	13 38	14 33	15 26	16 18
10	18 24	19 39	13 19	14 10	15 02	15 54
0	18 10	19 23	13 01	13 50	14 40	15 32
10	17 56	19 09	12 43	13 29	14 18	15 09
20	17 42	18 58	12 23	13 07	13 54	14 45
30	17 25	18 48	12 01	12 41	13 26	14 16
35	17 15	18 43	11 48	12 26	13 10	14 00
40	17 04	18 38	11 33	12 08	12 50	13 40
45	16 51	18 33	11 16	11 48	12 27	13 16
50	16 36	18 30	10 54	11 21	11 58	12 45
52	16 28	18 27	10 44	11 08	11 43	12 30
54	16 20	18 25	10 32	10 54	11 26	12 12
56	16 11	18 24	10 19	10 37	11 05	11 51
58	16 01	18 22	10 03	10 16	10 40	11 23
60	15 49	18 20	9 45	9 51	10 05	10 42
S						

GCT	Equation of Time (App.—Mean) 27	28	29
h	m s	m s	m s
0	− 6 24.2	− 6 24.0	− 6 23.3
6	− 6 24.2	− 6 23.9	− 6 23.0
12	− 6 24.2	− 6 23.7	− 6 22.6
18	− 6 24.1	− 6 23.5	− 6 22.3
24	− 6 24.0	− 6 23.3	− 6 21.9

GCT of Transit Meridian of Greenwich

DAY	Moon	Venus	Mars	Jupiter	Saturn
	h m	h m	h m	h m	h m
27	6 49	14 38	10 51	4 38	15 39
28	7 38	14 36	10 50	4 34	15 36
29	8 28	14 34	10 49	4 30	15 32
30	9 19	14 31	10 48	4 26	15 29

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb	Venus	Mars
°	′	′	′
0			
	0.1	0.3	0.1
30			
	0.1	0.2	0.0
45			
	0.1	0.2	0.0
60			
	0.1	0.1	0.0
75			
	0.1	0.0	0.0
90			

Moon's Lower Limb
Add

Alt.	27	28	29
°	′	′	′
0			
	12.5	12.1	11.9
4			
	12.5	12.1	11.9
8			
	12.5	12.2	11.9
12			
	12.6	12.2	11.9
16			
	12.6	12.2	12.0
20			
	12.7	12.3	12.1
24			
	12.7	12.4	12.2
28			
	12.8	12.5	12.2
32			
	12.9	12.6	12.4
36			
	13.0	12.7	12.5
40			
	13.1	12.8	12.6
44			
	13.2	12.9	12.7
48			
	13.4	13.1	12.9
52			
	13.5	13.2	13.1
56			
	13.6	13.4	13.2
60			
	13.8	13.5	13.4
64			
	13.9	13.7	13.6
68			
	14.1	13.9	13.8
72			
	14.2	14.1	14.0
76			
	14.4	14.3	14.2
80			
	14.6	14.4	14.4
84			
	14.7	14.6	14.6
88			
	14.9	14.8	14.7
90			

Add to table, back cover

Moon's Upper Limb
Subtract

Alt.	27	28	29
°	′	′	′
0			
	17.3	17.5	17.7
4			
	17.3	17.5	17.6
8			
	17.3	17.5	17.6
12			
	17.2	17.4	17.6
16			
	17.2	17.4	17.5
20			
	17.1	17.3	17.5
24			
	17.1	17.2	17.4
28			
	17.0	17.2	17.3
32			
	16.9	17.1	17.2
36			
	16.8	16.9	17.0
40			
	16.7	16.8	16.9
44			
	16.6	16.7	16.8
48			
	16.4	16.6	16.6
52			
	16.3	16.4	16.5
56			
	16.2	16.2	16.3
60			
	16.0	16.1	16.1
64			
	15.9	15.9	15.9
68			
	15.7	15.7	15.8
72			
	15.6	15.6	15.6
76			
	15.4	15.4	15.4
80			
	15.2	15.2	15.2
84			
	15.1	15.0	15.0
88			
	14.9	14.9	14.8
90			

Subtract from table, back cover

GCT	♈ GHA	VENUS −4.2 GHA	Dec.	MARS 1.9 GHA	Dec.	JUPITER −2.2 GHA	Dec.	SATURN 1.3 GHA	Dec.	MOON GHA	code	Dec.	code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
0	306 49.5	141 51.4	+ 3 34.7	197 55.3	+23 09.7	293 15.6	+ 4 15.3	127 15.8	+ 2 35.8	225 02.6	100	+28 18.0	+ 11
1	321 51.9	156 53.0	33.8	212 56.0	09.5	308 18.0	15.3	142 18.1	35.7	239 31.6	99	28 19.1	+ 9
2	336 54.4	171 54.5	33.0	227 56.7	09.3	323 20.4	15.3	157 20.3	35.6	254 00.5	99	28 20.0	+ 8
3	351 56.9	186 56.1	32.1	242 57.4	09.1	338 22.8	15.3	172 22.6	35.5	268 29.4	100	28 20.8	+ 6
4	6 59.3	201 57.7	31.3	257 58.1	08.9	353 25.3	15.3	187 24.8	35.4	282 58.4	99	28 21.4	+ 5
5	22 01.8	216 59.3	30.4	272 58.7	08.7	8 27.7	15.3	202 27.1	35.3	297 27.3	99	28 21.9	+ 4
6	37 04.2	232 00.8	+ 3 29.5	287 59.4	+23 08.5	23 30.1	+ 4 15.3	217 29.4	+ 2 35.2	311 56.2	99	+28 22.3	+ 2
7	52 06.7	247 02.4	28.7	303 00.1	08.3	38 32.5	15.3	232 31.6	35.1	326 25.1	99	28 22.5	+ 1
8	67 09.2	262 04.0	27.8	318 00.8	08.1	53 34.9	15.3	247 33.9	35.0	340 54.0	99	28 22.6	− 1
9	82 11.6	277 05.6	27.0	333 01.5	07.9	68 37.4	15.3	262 36.1	34.9	355 22.9	99	28 22.5	− 2
10	97 14.1	292 07.2	26.1	348 02.2	07.7	83 39.8	15.3	277 38.4	34.8	9 51.8	99	28 22.3	− 3
11	112 16.6	307 08.8	25.3	3 02.9	07.5	98 42.2	15.3	292 40.7	34.7	24 20.7	99	28 22.0	− 4
12	127 19.0	322 10.4	+ 3 24.4	18 03.6	+23 07.3	113 44.6	+ 4 15.3	307 42.9	+ 2 34.6	38 49.6	99	+28 21.6	− 6
13	142 21.5	337 12.0	23.6	33 04.3	07.2	128 47.1	15.3	322 45.2	34.5	53 18.5	100	28 21.0	− 8
14	157 24.0	352 13.6	22.7	48 05.0	07.0	143 49.5	15.3	337 47.4	34.4	67 47.5	99	28 20.2	− 8
15	172 26.4	7 15.2	21.9	63 05.7	06.8	158 51.9	15.3	352 49.7	34.3	82 16.4	99	28 19.4	− 11
16	187 28.9	22 16.8	21.0	78 06.3	06.6	173 54.3	15.3	7 51.9	34.2	96 45.3	99	28 18.3	− 11
17	202 31.4	37 18.4	20.2	93 07.0	06.4	188 56.8	15.3	22 54.2	34.1	111 14.2	100	28 17.2	− 13
18	217 33.8	52 20.0	+ 3 19.3	108 07.7	+23 06.2	203 59.2	+ 4 15.3	37 56.5	+ 2 34.0	125 43.2	99	+28 15.9	− 14
19	232 36.3	67 21.7	18.5	123 08.4	06.0	219 01.6	15.3	52 58.7	33.9	140 12.1	100	28 14.5	− 16
20	247 38.7	82 23.3	17.6	138 09.1	05.8	234 04.0	15.4	68 01.0	33.8	154 41.1	100	28 12.9	− 16
21	262 41.2	97 24.9	16.8	153 09.8	05.6	249 06.5	15.4	83 03.2	33.8	169 10.1	100	28 11.3	− 19
22	277 43.7	112 26.5	15.9	168 10.5	05.4	264 08.9	15.4	98 05.5	33.7	183 39.1	100	28 09.4	− 19
23	292 46.1	127 28.2	15.1	183 11.2	05.2	279 11.3	15.4	113 07.7	33.6	198 08.1	100	28 07.5	− 21
0	307 48.6	142 29.8	+ 3 14.2	198 11.9	+23 05.0	294 13.7	+ 4 15.4	128 10.0	+ 2 33.5	212 37.1	100	+28 05.4	− 23
1	322 51.1	157 31.4	13.4	213 12.6	04.8	309 16.2	15.4	143 12.3	33.4	227 06.1	101	28 03.1	− 23
2	337 53.5	172 33.0	12.6	228 13.3	04.6	324 18.6	15.4	158 14.5	33.3	241 35.2	100	28 00.8	− 26
3	352 56.0	187 34.7	11.7	243 14.0	04.4	339 21.0	15.4	173 16.8	33.2	256 04.2	101	27 58.2	− 26
4	7 58.5	202 36.3	10.9	258 14.6	04.2	354 23.4	15.4	188 19.0	33.1	270 33.3	101	27 55.6	− 28
5	23 00.9	217 38.0	10.0	273 15.3	04.0	9 25.9	15.4	203 21.3	33.0	285 02.4	102	27 52.8	− 29
6	38 03.4	232 39.6	+ 3 09.2	288 16.0	+23 03.8	24 28.3	+ 4 15.4	218 23.5	+ 2 32.9	299 31.6	101	+27 49.9	− 30
7	53 05.9	247 41.3	08.4	303 16.7	03.6	39 30.7	15.4	233 25.8	32.8	314 00.7	102	27 46.9	− 32
8	68 08.3	262 42.9	07.5	318 17.4	03.4	54 33.2	15.4	248 28.0	32.7	328 29.9	102	27 43.7	− 33
9	83 10.8	277 44.6	06.7	333 18.1	03.2	69 35.6	15.4	263 30.3	32.6	342 59.1	103	27 40.4	− 35
10	98 13.2	292 46.2	05.8	348 18.8	03.0	84 38.0	15.4	278 32.6	32.5	357 28.4	102	27 36.9	− 35
11	113 15.7	307 47.9	05.0	3 19.5	02.8	99 40.4	15.4	293 34.8	32.4	11 57.6	103	27 33.4	− 37
12	128 18.2	322 49.6	+ 3 04.2	18 20.2	+23 02.6	114 42.9	+ 4 15.4	308 37.1	+ 2 32.3	26 26.9	103	+27 29.7	− 39
13	143 20.6	337 51.2	03.3	33 20.9	02.4	129 45.3	15.4	323 39.3	32.2	40 56.2	104	27 25.8	− 40
14	158 23.1	352 52.9	02.5	48 21.6	02.1	144 47.7	15.4	338 41.6	32.1	55 25.6	104	27 21.8	− 41
15	173 25.6	7 54.6	01.7	63 22.3	01.9	159 50.2	15.4	353 43.8	32.0	69 55.0	104	27 17.7	− 42
16	188 28.0	22 56.2	00.8	78 23.0	01.7	174 52.6	15.4	8 46.1	31.9	84 24.4	105	27 13.5	− 44
17	203 30.5	37 57.9	3 00.0	93 23.7	01.5	189 55.0	15.4	23 48.3	31.8	98 53.9	104	27 09.1	− 45
18	218 33.0	52 59.6	+ 2 59.2	108 24.4	+23 01.3	204 57.5	+ 4 15.4	38 50.6	+ 2 31.7	113 23.3	106	+27 04.6	− 46
19	233 35.4	68 01.3	58.4	123 25.1	01.1	219 59.9	15.4	53 52.8	31.6	127 52.9	105	27 00.0	− 48
20	248 37.9	83 03.0	57.5	138 25.8	00.9	235 02.3	15.4	68 55.1	31.5	142 22.4	106	26 55.2	− 48
21	263 40.4	98 04.6	56.7	153 26.4	00.7	250 04.8	15.4	83 57.4	31.4	156 52.0	107	26 50.4	− 50
22	278 42.8	113 06.3	55.9	168 27.1	00.5	265 07.2	15.4	98 59.6	31.3	171 21.7	106	26 45.4	− 52
23	293 45.3	128 08.0	55.0	183 27.8	00.3	280 09.6	15.4	114 01.9	31.2	185 51.3	107	26 40.2	− 53
0	308 47.7	143 09.7	+ 2 54.2	198 28.5	+23 00.1	295 12.1	+ 4 15.4	129 04.1	+ 2 31.1	200 21.0	108	+26 34.9	− 54
1	323 50.2	158 11.4	53.4	213 29.2	22 59.9	310 14.5	15.4	144 06.4	31.0	214 50.8	108	26 29.5	− 55
2	338 52.7	173 13.1	52.6	228 29.9	59.7	325 16.9	15.4	159 08.6	30.9	229 20.6	108	26 24.0	− 56
3	353 55.1	188 14.8	51.7	243 30.6	59.5	340 19.4	15.4	174 10.9	30.8	243 50.4	109	26 18.4	− 58
4	8 57.6	203 16.5	50.9	258 31.3	59.3	355 21.8	15.4	189 13.1	30.7	258 20.3	109	26 12.6	− 59
5	24 00.1	218 18.2	50.1	273 32.0	59.1	10 24.2	15.4	204 15.4	30.6	272 50.2	110	26 06.7	− 60
6	39 02.5	233 19.9	+ 2 49.3	288 32.7	+22 58.8	25 26.7	+ 4 15.4	219 17.6	+ 2 30.5	287 20.2	110	+26 00.7	− 61
7	54 05.0	248 21.7	48.5	303 33.4	58.6	40 29.1	15.4	234 19.9	30.5	301 50.2	111	25 54.6	− 63
8	69 07.5	263 23.4	47.6	318 34.1	58.4	55 31.5	15.4	249 22.1	30.4	316 20.3	111	25 48.3	− 64
9	84 09.9	278 25.1	46.8	333 34.8	58.2	70 34.0	15.4	264 24.4	30.3	330 50.4	111	25 41.9	− 65
10	99 12.4	293 26.8	46.0	348 35.5	58.0	85 36.4	15.4	279 26.7	30.2	345 20.5	112	25 35.4	− 66
11	114 14.8	308 28.6	45.2	3 36.2	57.8	100 38.9	15.4	294 28.9	30.1	359 50.7	113	25 28.8	− 68
12	129 17.3	323 30.3	+ 2 44.4	18 36.9	+22 57.6	115 41.3	+ 4 15.4	309 31.2	+ 2 30.0	14 21.0	113	+25 22.0	− 68
13	144 19.8	338 32.0	43.5	33 37.6	57.4	130 43.7	15.4	324 33.4	29.9	28 51.3	113	25 15.2	− 70
14	159 22.2	353 33.7	42.7	48 38.3	57.2	145 46.2	15.4	339 35.7	29.8	43 21.6	114	25 08.2	− 71
15	174 24.7	8 35.5	41.9	63 39.0	56.9	160 48.6	15.4	354 37.9	29.7	57 52.0	115	25 01.1	− 73
16	189 27.2	23 37.2	41.1	78 39.7	56.7	175 51.1	15.4	9 40.2	29.6	72 22.5	115	24 53.8	− 73
17	204 29.6	38 39.0	40.3	93 40.4	56.5	190 53.5	15.4	24 42.4	29.5	86 53.0	115	24 46.5	− 75
18	219 32.1	53 40.7	+ 2 39.5	108 41.1	+22 56.3	205 55.9	+ 4 15.4	39 44.7	+ 2 29.4	101 23.5	116	+24 39.0	− 75
19	234 34.6	68 42.5	38.7	123 41.8	56.1	220 58.4	15.4	54 46.9	29.3	115 54.1	117	24 31.5	− 77
20	249 37.0	83 44.2	37.9	138 42.5	55.9	236 00.8	15.3	69 49.2	29.2	130 24.8	117	24 23.8	− 78
21	264 39.5	98 46.0	37.0	153 43.2	55.7	251 03.3	15.3	84 51.4	29.1	144 55.5	117	24 16.0	− 79
22	279 42.0	113 47.7	36.2	168 43.9	55.5	266 05.7	15.3	99 53.7	29.0	159 26.2	118	24 08.1	− 80
23	294 44.4	128 49.5	35.4	183 44.6	55.2	281 08.1	15.3	114 55.9	28.9	173 57.0	119	24 00.1	− 82
24	309 46.9	143 51.3	+ 2 34.6	198 45.3	+22 55.0	296 10.6	+ 4 15.3	129 58.2	+ 2 28.8	188 27.9	119	+23 51.9	− 82
code	—	+ 16	− 9	+ 7	− 2	+ 24	0	+ 22	− 1				

GCT	SUN GHA	SUN Dec.
h	° ′	° ′
0	178 24.5	+18 46.2
1	193 24.6	45.6
2	208 24.6	45.0
3	223 24.6	·· 44.4
4	238 24.6	43.8
5	253 24.6	43.2
6	268 24.6	+18 42.7
7	283 24.7	42.1
8	298 24.7	41.5
9	313 24.7	·· 40.9
10	328 24.7	40.3
11	343 24.7	39.7
12	358 24.8	+18 39.1
13	13 24.8	38.5
14	28 24.8	37.9
15	43 24.8	·· 37.3
16	58 24.8	36.7
17	73 24.9	36.1
18	88 24.9	+18 35.5
19	103 24.9	34.9
20	118 24.9	34.3
21	133 25.0	·· 33.7
22	148 25.0	33.1
23	163 25.0	32.5
0	178 25.0	+18 31.9
1	193 25.1	31.3
2	208 25.1	30.7
3	223 25.1	·· 30.1
4	238 25.1	29.4
5	253 25.1	28.8
6	268 25.2	+18 28.2
7	283 25.2	27.6
8	298 25.2	27.0
9	313 25.3	·· 26.4
10	328 25.3	25.8
11	343 25.3	25.2
12	358 25.3	+18 24.6
13	13 25.4	24.0
14	28 25.4	23.4
15	43 25.4	·· 22.7
16	58 25.4	22.1
17	73 25.5	21.5
18	88 25.5	+18 20.9
19	103 25.5	20.3
20	118 25.6	19.7
21	133 25.6	·· 19.1
22	148 25.6	18.4
23	163 25.6	17.8
0	178 25.7	+18 17.2
1	193 25.7	16.6
2	208 25.7	16.0
3	223 25.8	·· 15.4
4	238 25.8	14.7
5	253 25.8	14.1
6	268 25.9	+18 13.5
7	283 25.9	12.9
8	298 25.9	12.3
9	313 26.0	·· 11.6
10	328 26.0	11.0
11	343 26.0	10.4
12	358 26.0	+18 09.8
13	13 26.1	09.2
14	28 26.1	08.5
15	43 26.2	·· 07.9
16	58 26.2	07.3
17	73 26.2	06.7
18	88 26.3	+18 06.0
19	103 26.3	05.4
20	118 26.3	04.8
21	133 26.4	·· 04.2
22	148 26.4	03.5
23	163 26.4	02.9
24	178 26.5	+18 02.3
code	–	– 6

No.	STARS SHA	Dec.	Transit Mer. Gr.
	° ′	° ′	h m
1	358 31.6	+28 49.4	3 34
2	358 21.1	+58 52.8	3 35
3	349 42.3	−18 14.9	4 09
4	339 20.5	+59 58.9	4 51
5	336 00.9	−57 28.5	5 04
6	332 35.8	+89 02.0	5 18
7	328 53.4	+23 14.1	5 32
8	315 53.5	−40 29.5	6 24
9	309 47.3	+49 41.4	6 48
10	291 43.0	+16 25.0	8 01
11	281 57.0	− 8 15.1	8 40
12	281 43.6	+45 57.1	8 40
13	279 22.2	+ 6 18.6	8 50
14	279 11.7	+28 34.2	8 51
15	276 33.8	− 1 13.6	9 01
16	271 51.9	+ 7 24.2	9 20
17	264 17.3	−52 39.8	9 50
18	259 15.0	−16 38.6	10 10
19	255 49.5	−28 54.0	10 24
20	245 48.7	+ 5 21.2	11 04
21	244 24.9	+28 08.8	11 09
22	234 37.9	−59 21.0	11 48
23	223 27.3	−43 14.1	12 33
24	221 51.0	−69 31.0	12 39
25	218 42.1	− 8 26.7	12 52
26	208 33.3	+12 12.4	13 32
27	194 48.8	+62 01.0	14 27
28	183 21.2	+14 50.7	15 13
29	174 02.1	−62 50.1	15 50
30	172 53.4	−56 50.8	15 55
31	168 47.2	−59 25.7	16 11
32	167 01.4	+56 13.6	16 18
33	159 30.2	+55 10.9	16 48
34	159 20.4	−10 54.6	16 49
35	153 35.4	+49 33.5	17 12
36	149 02.6	−36 08.2	17 30
37	146 38.1	+19 26.1	17 39
38	140 55.7	−60 38.7	18 02
39	137 17.1	+74 21.4	18 17
40	126 50.2	+26 52.7	18 58
41	120 37.8	−22 29.3	19 23
42	113 23.2	−26 19.8	19 52
43	109 06.6	−68 56.9	20 09
44	103 05.7	−15 40.1	20 33
45	97 24.8	−37 04.4	20 56
46	96 49.4	+12 35.6	20 58
47	91 07.3	+51 29.7	21 21
48	84 45.1	−34 24.7	21 46
49	81 10.1	+38 44.3	22 00
50	76 55.6	−26 21.6	22 17
51	62 53.3	+ 8 44.3	23 13
52	54 31.7	−56 53.6	23 47
53	50 02.9	+45 06.4	0 09
54	34 32.5	+ 9 39.1	1 10
55	28 41.4	−47 11.7	1 34
56	16 14.8	−29 52.6	2 23
57	14 24.5	+14 56.7	2 31

Lat.	Sunrise	Twlt. begins	Moonrise 30	31	1	2
N °	h m	h m	h m	h m	h m	h m
70	1 08	////	□	□	□	□
68	2 05	////	□	□	□	□
66	2 38	////	□	□	□	0 00
64	3 02	////	□	□	□	1 14
62	3 21	////	□	24 01	0 01	1 50
60	3 36	////	23 19	24 43	0 43	2 16
58	3 49	////	23 56	25 11	1 11	2 36
56	4 00	////	24 22	0 22	1 33	2 53
54	4 10	////	24 43	0 43	1 51	3 07
52	4 19	1 12	0 07	1 01	2 06	3 19
50	4 27	1 45	0 22	1 15	2 19	3 30
45	4 43	2 35	0 52	1 45	2 46	3 52
40	4 57	3 06	1 16	2 09	3 08	4 10
35	5 08	3 29	1 35	2 28	3 25	4 25
30	5 18	3 47	1 52	2 44	3 40	4 38
20	5 35	4 14	2 20	3 12	4 06	5 00
10	5 49	4 34	2 44	3 36	4 28	5 20
0	6 03	4 50	3 07	3 58	4 49	5 37
10	6 16	5 04	3 29	4 20	5 09	5 55
20	6 31	5 15	3 54	4 44	5 31	6 14
30	6 47	5 24	4 22	5 12	5 57	6 36
35	6 56	5 29	4 39	5 28	6 11	6 49
40	7 07	5 34	4 58	5 47	6 29	7 03
45	7 19	5 38	5 22	6 10	6 49	7 20
50	7 34	5 43	5 53	6 40	7 15	7 42
52	7 41	5 44	6 08	6 54	7 28	7 52
54	7 49	5 46	6 26	7 11	7 42	8 03
56	7 58	5 47	6 48	7 31	7 59	8 16
58	8 07	5 50	7 16	7 56	8 19	8 31
60	8 19	5 51	7 56	8 31	8 44	8 49
S						

Lat.	Sunset	Twlt. ends	Moonset 30	31	1	2
N °	h m	h m	h m	h m	h m	h m
70	22 55	////	□	□	□	□
68	22 03	////	□	□	□	22 33
66	21 31	////	□	□	23 03	21 54
64	21 08	////	□	□	21 47	21 26
62	20 50	////	□	21 18	21 10	21 05
60	20 35	////	20 13	20 35	20 44	20 48
58	20 22	////	19 36	20 07	20 24	20 33
56	20 11	////	19 09	19 45	20 06	20 20
54	20 01	////	18 48	19 26	19 52	20 09
52	19 53	22 55	18 31	19 11	19 39	20 00
50	19 45	22 23	18 16	18 57	19 28	19 51
45	19 29	21 35	17 46	18 30	19 04	19 32
40	19 16	21 05	17 23	18 08	18 46	19 17
35	19 04	20 42	17 03	17 50	18 30	19 04
30	18 55	20 25	16 46	17 34	18 16	18 53
20	18 38	19 58	16 18	17 07	17 52	18 33
10	18 23	19 38	15 54	16 44	17 32	18 16
0	18 10	19 22	15 32	16 23	17 12	18 00
10	17 57	19 10	15 09	16 01	16 53	17 44
20	17 43	18 59	14 45	15 38	16 32	17 27
30	17 27	18 50	14 16	15 11	16 08	17 06
35	17 17	18 44	14 00	14 55	15 54	16 55
40	17 07	18 41	13 40	14 36	15 37	16 41
45	16 54	18 36	13 16	14 13	15 17	16 25
50	16 40	18 33	12 45	13 45	14 52	16 04
52	16 33	18 31	12 30	13 30	14 40	15 55
54	16 25	18 29	12 12	13 13	14 26	15 44
56	16 16	18 28	11 51	12 54	14 10	15 32
58	16 06	18 26	11 23	12 29	13 50	15 17
60	15 55	18 25	10 42	11 55	13 26	15 00
S						

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb	Venus	Mars
°	′	′	′
0			
	0.1	0.3	0.1
30			
	0.1	0.2	0.0
45			
	0.1	0.2	0.0
60			
	0.1	0.1	0.0
75			
	0.1	0.0	0.0
90			

Moon's Lower Limb
Add

Alt.	30	31	1
°	′	′	′
0			
	11.7	11.9	12.0
4			
	11.7	11.9	12.0
8			
	11.8	11.9	12.0
12			
	11.8	11.9	12.1
16			
	11.9	12.0	12.1
20			
	12.0	12.1	12.2
24			
	12.0	12.2	12.3
28			
	12.1	12.2	12.4
32			
	12.2	12.4	12.5
36			
	12.4	12.5	12.6
40			
	12.5	12.6	12.7
44			
	12.6	12.7	12.8
48			
	12.8	12.9	13.0
52			
	13.0	13.1	13.1
56			
	13.1	13.2	13.3
60			
	13.3	13.4	13.5
64			
	13.5	13.6	13.6
68			
	13.7	13.8	13.8
72			
	13.9	14.0	14.0
76			
	14.1	14.2	14.2
80			
	14.3	14.4	14.4
84			
	14.5	14.6	14.6
88			
	14.7	14.7	14.7
90			

Add to table, back cover

Moon's Upper Limb
Subtract

Alt.	30	31	1
°	′	′	′
0			
	17.7	17.7	17.6
4			
	17.7	17.6	17.6
8			
	17.7	17.6	17.5
12			
	17.6	17.6	17.5
16			
	17.6	17.5	17.5
20			
	17.5	17.5	17.4
24			
	17.4	17.4	17.3
28			
	17.3	17.3	17.2
32			
	17.2	17.2	17.1
36			
	17.1	17.0	17.0
40			
	17.0	16.9	16.9
44			
	16.8	16.8	16.7
48			
	16.7	16.6	16.6
52			
	16.5	16.5	16.4
56			
	16.3	16.3	16.3
60			
	16.1	16.1	16.1
64			
	16.0	15.9	15.9
68			
	15.8	15.8	15.7
72			
	15.6	15.6	15.6
76			
	15.4	15.4	15.4
80			
	15.2	15.2	15.2
84			
	14.9	15.0	15.0
88			
	14.8	14.8	14.8
90			

Subtract from table, back cover

GCT	Equation of Time (App.—Mean) 30	31	1
h	m s	m s	m s
0	− 6 21.9	− 6 19.9	− 6 17.4
6	− 6 21.5	− 6 19.4	− 6 16.6
12	− 6 21.0	− 6 18.7	− 6 15.9
18	− 6 20.5	− 6 18.1	− 6 15.1
24	− 6 19.9	− 6 17.4	− 6 14.2

GCT of Transit Meridian of Greenwich

DAY	Moon	Venus	Mars	Jupiter	Saturn
	h m	h m	h m	h m	h m
30	9 19	14 31	10 48	4 26	15 29
31	10 11	14 28	10 47	4 22	15 25
1	11 01	14 26	10 46	4 19	15 21
2	11 49	14 23	10 45	4 15	15 18

833190°—50——10

GCT	♈ GHA	VENUS −4.2 GHA	VENUS Dec.	MARS 1.9 GHA	MARS Dec.	JUPITER −2.2 GHA	JUPITER Dec.	SATURN 1.3 GHA	SATURN Dec.	MOON GHA	code	MOON Dec.	code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
0	309 46.9	143 51.3	+ 2 34.6	198 45.3	+22 55.0	296 10.6	+ 4 15.3	129 58.2	+ 2 28.8	188 27.9	119	+23 51.9	− 82
1	324 49.3	158 53.0	33.8	213 46.0	54.8	311 13.0	15.3	145 00.4	28.7	202 58.8	120	23 43.7	− 84
2	339 51.8	173 54.8	33.0	228 46.7	54.6	326 15.5	15.3	160 02.7	28.6	217 29.8	120	23 35.3	− 84
3	354 54.3	188 56.6	·· 32.2	243 47.4	·· 54.4	341 17.9	·· 15.3	175 04.9	·· 28.5	232 00.8	121	·23 26.9	− 86
4	9 56.7	203 58.3	31.4	258 48.1	54.2	356 20.4	15.3	190 07.2	28.4	246 31.9	121	23 18.3	− 87
5	24 59.2	219 00.1	30.6	273 48.8	54.0	11 22.8	15.3	205 09.4	28.3	261 03.0	122	23 09.6	− 88
6	40 01.7	234 01.9	+ 2 29.8	288 49.5	+22 53.7	26 25.2	+ 4 15.3	220 11.7	+ 2 28.2	275 34.2	122	+23 00.8	− 89
7	55 04.1	249 03.7	29.0	303 50.2	53.5	41 27.7	15.3	235 13.9	28.1	290 05.4	123	22 51.9	− 90
8	70 06.6	264 05.5	28.2	318 50.9	53.3	56 30.1	15.3	250 16.2	28.0	304 36.7	124	22 42.9	− 91
9	85 09.1	279 07.2	·· 27.4	333 51.6	·· 53.1	71 32.6	·· 15.3	265 18.4	·· 27.9	319 08.1	124	·22 33.8	− 92
10	100 11.5	294 09.0	26.6	348 52.3	52.9	86 35.0	15.3	280 20.7	27.8	333 39.5	124	22 24.6	− 93
11	115 14.0	309 10.8	25.8	3 53.0	52.7	101 37.5	15.3	295 22.9	27.7	348 10.9	126	22 15.3	− 94
12	130 16.5	324 12.6	+ 2 25.0	18 53.7	+22 52.4	116 39.9	+ 4 15.3	310 25.2	+ 2 27.6	2 42.5	125	+22 05.9	− 96
13	145 18.9	339 14.4	24.2	33 54.4	52.2	131 42.4	15.3	325 27.4	27.5	17 14.0	127	21 56.3	− 96
14	160 21.4	354 16.2	23.4	48 55.1	52.0	146 44.8	15.3	340 29.7	27.4	31 45.7	126	21 46.7	− 97
15	175 23.8	9 18.0	·· 22.6	63 55.8	·· 51.8	161 47.2	·· 15.3	355 31.9	·· 27.3	46 17.3	128	·21 37.0	− 98
16	190 26.3	24 19.9	21.8	78 56.5	51.6	176 49.7	15.3	10 34.2	27.2	60 49.1	128	21 27.2	− 99
17	205 28.8	39 21.7	21.0	93 57.2	51.3	191 52.1	15.3	25 36.4	27.1	75 20.9	128	21 17.3	−100
18	220 31.2	54 23.5	+ 2 20.2	108 57.9	+22 51.1	206 54.6	+ 4 15.2	40 38.7	+ 2 27.0	89 52.7	129	+21 07.3	−102
19	235 33.7	69 25.3	19.5	123 58.6	50.9	221 57.0	15.2	55 40.9	26.9	104 24.6	130	20 57.1	−102
20	250 36.2	84 27.1	18.7	138 59.3	50.7	236 59.5	15.2	70 43.2	26.8	118 56.6	130	20 46.9	−103
21	265 38.6	99 28.9	·· 17.9	154 00.0	·· 50.5	252 01.9	·· 15.2	85 45.4	·· 26.7	133 28.6	130	·20 36.6	−104
22	280 41.1	114 30.8	17.1	169 00.7	50.2	267 04.4	15.2	100 47.7	26.6	148 00.6	131	20 26.2	−104
23	295 43.6	129 32.6	16.3	184 01.4	50.0	282 06.8	15.2	115 49.9	26.5	162 32.7	132	20 15.8	−106
0	310 46.0	144 34.4	+ 2 15.5	199 02.1	+22 49.8	297 09.3	+ 4 15.2	130 52.2	+ 2 26.4	177 04.9	132	+20 05.2	−107
1	325 48.5	159 36.3	14.7	214 02.8	49.6	312 11.7	15.2	145 54.4	26.3	191 37.1	133	19 54.5	−108
2	340 51.0	174 38.1	13.9	229 03.5	49.3	327 14.2	15.2	160 56.7	26.2	206 09.4	133	19 43.7	−108
3	355 53.4	189 39.9	·· 13.2	244 04.2	·· 49.1	342 16.6	·· 15.2	175 58.9	·· 26.1	220 41.7	134	·19 32.9	−109
4	10 55.9	204 41.8	12.4	259 05.0	48.9	357 19.1	15.2	191 01.2	26.0	235 14.1	135	19 22.0	−111
5	25 58.3	219 43.6	11.6	274 05.7	48.7	12 21.5	15.2	206 03.4	25.9	249 46.6	134	19 10.9	−111
6	41 00.8	234 45.5	+ 2 10.8	289 06.4	+22 48.5	27 24.0	+ 4 15.2	221 05.7	+ 2 25.8	264 19.0	136	+18 59.8	−112
7	56 03.3	249 47.3	10.0	304 07.1	48.2	42 26.4	15.2	236 07.9	25.7	278 51.6	136	18 48.6	−113
8	71 05.7	264 49.2	09.3	319 07.8	48.0	57 28.9	15.1	251 10.2	25.6	293 24.2	136	18 37.3	−114
9	86 08.2	279 51.1	·· 08.5	334 08.5	·· 47.8	72 31.3	·· 15.1	266 12.4	·· 25.5	307 56.8	137	·18 25.9	−114
10	101 10.7	294 52.9	07.7	349 09.2	47.6	87 33.8	15.1	281 14.7	25.4	322 29.5	137	18 14.5	−115
11	116 13.1	309 54.8	06.9	4 09.9	47.3	102 36.2	15.1	296 16.9	25.3	337 02.2	138	18 03.0	−117
12	131 15.6	324 56.7	+ 2 06.1	19 10.6	+22 47.1	117 38.7	+ 4 15.1	311 19.2	+ 2 25.2	351 35.0	139	+17 51.3	−117
13	146 18.1	339 58.5	05.4	34 11.3	46.9	132 41.2	15.1	326 21.4	25.1	6 07.9	139	17 39.6	−117
14	161 20.5	355 00.4	04.6	49 12.0	46.7	147 43.6	15.1	341 23.7	25.0	20 40.8	139	17 27.9	−119
15	176 23.0	10 02.3	·· 03.8	64 12.7	·· 46.4	162 46.1	·· 15.1	356 25.9	·· 24.9	35 13.7	140	·17 16.0	−119
16	191 25.4	25 04.2	03.1	79 13.4	46.2	177 48.5	15.1	11 28.2	24.8	49 46.7	140	17 04.1	−121
17	206 27.9	40 06.0	02.3	94 14.1	46.0	192 51.0	15.1	26 30.4	24.7	64 19.7	141	16 52.0	−121
18	221 30.4	55 07.9	+ 2 01.5	109 14.8	+22 45.7	207 53.4	+ 4 15.1	41 32.7	+ 2 24.6	78 52.8	141	+16 39.9	−121
19	236 32.8	70 09.8	00.7	124 15.5	45.5	222 55.9	15.1	56 34.9	24.5	93 25.9	142	16 27.8	−123
20	251 35.3	85 11.7	2 00.0	139 16.3	45.3	237 58.3	15.0	71 37.2	24.4	107 59.1	142	16 15.5	−123
21	266 37.8	100 13.6	· 1 59.2	154 17.0	·· 45.1	253 00.8	·· 15.0	86 39.4	·· 24.3	122 32.3	143	·16 03.2	−124
22	281 40.2	115 15.5	58.4	169 17.7	44.8	268 03.2	15.0	101 41.7	24.2	137 05.6	143	15 50.8	−124
23	296 42.7	130 17.4	57.7	184 18.4	44.6	283 05.7	15.0	116 43.9	24.1	151 38.9	143	15 38.4	−126
0	311 45.2	145 19.3	+ 1 56.9	199 19.1	+22 44.4	298 08.2	+ 4 15.0	131 46.1	+ 2 24.0	166 12.2	144	+15 25.8	−126
1	326 47.6	160 21.2	56.2	214 19.8	44.1	313 10.6	15.0	146 48.4	23.9	180 45.6	144	15 13.2	−126
2	341 50.1	175 23.1	55.4	229 20.5	43.9	328 13.1	15.0	161 50.6	23.8	195 19.0	145	15 00.6	−128
3	356 52.6	190 25.0	·· 54.6	244 21.2	·· 43.7	343 15.5	·· 15.0	176 52.9	·· 23.7	209 52.5	145	·14 47.8	−128
4	11 55.0	205 27.0	53.9	259 21.9	43.5	358 18.0	15.0	191 55.1	23.6	224 26.0	146	14 35.0	−129
5	26 57.5	220 28.9	53.1	274 22.6	43.2	13 20.5	15.0	206 57.4	23.5	238 59.6	146	14 22.1	−129
6	41 59.9	235 30.8	+ 1 52.3	289 23.3	+22 43.0	28 22.9	+ 4 14.9	221 59.6	+ 2 23.4	253 33.2	146	+14 09.2	−130
7	57 02.4	250 32.7	51.6	304 24.0	42.8	43 25.4	14.9	237 01.9	23.3	268 06.8	147	13 56.2	−131
8	72 04.9	265 34.6	50.8	319 24.8	42.5	58 27.8	14.9	252 04.1	23.2	282 40.5	147	13 43.1	−131
9	87 07.3	280 36.6	·· 50.1	334 25.5	·· 42.3	73 30.3	·· 14.9	267 06.4	·· 23.1	297 14.2	147	·13 30.0	−132
10	102 09.8	295 38.5	49.3	349 26.2	42.1	88 32.8	14.9	282 08.6	23.0	311 47.9	148	13 16.8	−133
11	117 12.3	310 40.5	48.6	4 26.9	41.8	103 35.2	14.9	297 10.9	22.9	326 21.7	148	13 03.5	−133
12	132 14.7	325 42.4	+ 1 47.8	19 27.6	+22 41.6	118 37.7	+ 4 14.9	312 13.1	+ 2 22.8	340 55.5	149	+12 50.2	−134
13	147 17.2	340 44.3	47.1	34 28.3	41.4	133 40.1	14.9	327 15.3	22.7	355 29.4	149	12 36.8	−134
14	162 19.7	355 46.3	46.3	49 29.0	41.1	148 42.6	14.9	342 17.6	22.6	10 03.3	149	12 23.4	−135
15	177 22.1	10 48.2	·· 45.6	64 29.7	·· 40.9	163 45.1	·· 14.8	357 19.8	·· 22.5	24 37.2	149	·12 09.9	−135
16	192 24.6	25 50.2	44.8	79 30.4	40.7	178 47.5	14.8	12 22.1	22.4	39 11.1	150	11 56.4	−137
17	207 27.1	40 52.1	44.1	94 31.1	40.4	193 50.0	14.8	27 24.3	22.3	53 45.1	150	11 42.7	−136
18	222 29.5	55 54.1	+ 1 43.3	109 31.9	+22 40.2	208 52.4	+ 4 14.8	42 26.6	+ 2 22.2	68 19.1	150	+11 29.1	−137
19	237 32.0	70 56.1	42.6	124 32.6	40.0	223 54.9	14.8	57 28.8	22.1	82 53.1	151	11 15.4	−138
20	252 34.4	85 58.0	41.8	139 33.3	39.7	238 57.4	14.8	72 31.1	22.0	97 27.2	151	11 01.6	−138
21	267 36.9	101 00.0	·· 41.1	154 34.0	·· 39.5	253 59.8	·· 14.8	87 33.3	·· 21.9	112 01.3	151	·10 47.8	−139
22	282 39.4	116 02.0	40.3	169 34.7	39.3	269 02.3	14.8	102 35.6	21.8	126 35.4	151	10 33.9	−139
23	297 41.8	131 03.9	39.6	184 35.4	39.0	284 04.8	14.7	117 37.8	21.7	141 09.5	152	10 20.0	−140
24	312 44.3	146 05.9	+ 1 38.9	199 36.1	+22 38.8	299 07.2	+ 4 14.7	132 40.0	+ 2 21.6	155 43.7	152	+10 06.0	−140
code	—	+ 18	− 7	+ 7	− 2	+ 25	0	+ 22	− 1				

GCT h	SUN GHA ° ′	SUN Dec. ° ′
0	178 26.5	+18 02.3
1	193 26.5	01.6
2	208 26.5	01.0
3	223 26.6	·18 00.4
4	238 26.6	17 59.8
5	253 26.6	59.1
6	268 26.7	+17 58.5
7	283 26.7	57.9
8	298 26.8	57.2
9	313 26.8	·· 56.6
10	328 26.8	56.0
11	343 26.9	55.3
12	358 26.9	+17 54.7
13	13 27.0	54.0
14	28 27.0	53.4
15	43 27.0	·· 52.8
16	58 27.1	52.1
17	73 27.1	51.5
18	88 27.2	+17 50.9
19	103 27.2	50.2
20	118 27.2	49.6
21	133 27.3	·· 48.9
22	148 27.3	48.3
23	163 27.4	47.7
0	178 27.4	+17 47.0
1	193 27.5	46.4
2	208 27.5	45.7
3	223 27.5	·· 45.1
4	238 27.6	44.5
5	253 27.6	43.8
6	268 27.7	+17 43.2
7	283 27.7	42.5
8	298 27.8	41.9
9	313 27.8	·· 41.2
10	328 27.8	40.6
11	343 27.9	39.9
12	358 27.9	+17 39.3
13	13 28.0	38.6
14	28 28.0	38.0
15	43 28.1	·· 37.4
16	58 28.1	36.7
17	73 28.2	36.1
18	88 28.2	+17 35.4
19	103 28.3	34.8
20	118 28.3	34.1
21	133 28.4	·· 33.5
22	148 28.4	32.8
23	163 28.5	32.1
0	178 28.5	+17 31.5
1	193 28.6	30.8
2	208 28.6	30.2
3	223 28.7	·· 29.5
4	238 28.7	28.9
5	253 28.8	28.2
6	268 28.8	+17 27.6
7	283 28.9	26.9
8	298 28.9	26.3
9	313 29.0	·· 25.6
10	328 29.0	24.9
11	343 29.1	24.3
12	358 29.1	+17 23.6
13	13 29.2	23.0
14	28 29.2	22.3
15	43 29.3	·· 21.6
16	58 29.3	21.0
17	73 29.4	20.3
18	88 29.4	+17 19.7
19	103 29.5	19.0
20	118 29.5	18.3
21	133 29.6	·· 17.7
22	148 29.6	17.0
23	163 29.7	16.3
24	178 29.8	+17 15.7
code	–	– 7

STARS No.	SHA ° ′	Dec. ° ′	Transit Mer. Gr. h m
1	358 31.6	+28 49.4	3 22
2	358 21.1	+58 52.8	3 23
3	349 42.3	−18 14.9	3 57
4	339 20.5	+59 58.9	4 39
5	336 00.9	−57 28.5	4 52
6	332 34.8	+89 02.0	5 06
7	328 53.3	+23 14.1	5 21
8	315 53.5	−40 29.5	6 12
9	309 47.3	+49 41.4	6 37
10	291 43.0	+16 25.0	7 49
11	281 57.0	− 8 15.1	8 28
12	281 43.6	+45 57.1	8 29
13	279 22.1	+ 6 18.7	8 38
14	279 11.7	+28 34.2	8 39
15	276 33.8	− 1 13.6	8 49
16	271 51.9	+ 7 24.2	9 08
17	264 17.3	−52 39.8	9 38
18	259 15.0	−16 38.6	9 58
19	255 49.5	−28 54.0	10 12
20	245 48.7	+ 5 21.2	10 52
21	244 24.9	+28 08.8	10 57
22	234 37.9	−59 21.0	11 36
23	223 27.3	−43 14.1	12 21
24	221 51.0	−69 31.0	12 27
25	218 42.1	− 8 26.7	12 40
26	208 33.3	+12 12.4	13 21
27	194 48.8	+62 01.0	14 15
28	183 21.2	+14 50.7	15 01
29	174 02.1	−62 50.1	15 38
30	172 53.4	−56 50.8	15 43
31	168 47.3	−59 25.7	15 59
32	167 01.4	+56 13.6	16 06
33	159 30.2	+55 10.9	16 36
34	159 20.4	−10 54.6	16 37
35	153 35.4	+49 33.5	17 00
36	149 02.7	−36 08.2	17 18
37	146 38.1	+19 26.1	17 28
38	140 55.7	−60 38.7	17 50
39	137 17.2	+74 21.4	18 05
40	126 50.2	+26 52.7	18 47
41	120 37.8	−22 29.3	19 11
42	113 23.2	−26 19.8	19 40
43	109 06.6	−68 56.9	19 57
44	103 05.7	−15 40.1	20 21
45	97 24.8	−37 04.4	20 44
46	96 49.4	+12 35.6	20 46
47	91 07.3	+51 29.7	21 09
48	84 45.1	−34 24.7	21 34
49	81 10.1	+38 44.3	21 49
50	76 55.6	−26 21.6	22 06
51	62 53.3	+ 8 44.3	23 02
52	54 31.7	−56 53.6	23 35
53	50 02.9	+45 06.4	23 53
54	34 32.5	+ 9 39.2	0 59
55	28 41.4	−47 11.7	1 22
56	16 14.8	−29 52.6	2 12
57	14 24.5	+14 56.7	2 19

Lat. N °	Sunrise h m	Twlt. begins h m	Moonrise 2 h m	Moonrise 3 h m	Moonrise 4 h m	Moonrise 5 h m
70	1 37	////	▭	0 40	4 02	6 10
68	2 21	////	▭	2 08	4 25	6 21
66	2 50	////	0 00	2 46	4 44	6 30
64	3 12	////	1 14	3 13	4 58	6 38
62	3 29	////	1 50	3 33	5 11	6 44
60	3 43	////	2 16	3 50	5 21	6 50
58	3 55	////	2 36	4 03	5 30	6 55
56	4 06	////	2 53	4 15	5 38	6 59
54	4 15	0 33	3 07	4 26	5 45	7 03
52	4 23	1 27	3 19	4 35	5 51	7 06
50	4 31	1 55	3 30	4 43	5 56	7 10
45	4 46	2 40	3 52	5 00	6 08	7 16
40	4 59	3 10	4 10	5 14	6 18	7 22
35	5 10	3 32	4 25	5 26	6 27	7 27
30	5 20	3 50	4 38	5 36	6 34	7 31
20	5 36	4 15	5 00	5 54	6 47	7 39
10	5 50	4 36	5 20	6 10	6 58	7 45
0	6 03	4 51	5 37	6 24	7 08	7 51
10	6 16	5 03	5 55	6 38	7 19	7 57
20	6 29	5 14	6 14	6 53	7 29	8 03
30	6 45	5 23	6 36	7 11	7 42	8 11
35	6 53	5 27	6 49	7 21	7 49	8 15
40	7 04	5 31	7 03	7 32	7 57	8 19
45	7 15	5 35	7 20	7 46	8 07	8 25
50	7 30	5 39	7 42	8 02	8 18	8 31
52	7 36	5 40	7 52	8 09	8 23	8 34
54	7 44	5 41	8 03	8 18	8 29	8 38
56	7 52	5 43	8 16	8 27	8 35	8 41
58	8 01	5 44	8 31	8 38	8 42	8 45
60 S	8 12	5 46	8 49	8 50	8 50	8 50

Lat. N °	Sunset h m	Twlt. ends h m	Moonset 2 h m	Moonset 3 h m	Moonset 4 h m	Moonset 5 h m
70	22 29	////	▭	{0 02 / 22 14}	21 36	21 08
68	21 47	////	22 33	21 49	21 23	21 02
66	21 19	////	21 54	21 29	21 12	20 58
64	20 58	////	21 26	21 13	21 03	20 54
62	20 41	////	21 05	21 00	20 55	20 50
60	20 27	////	20 48	20 49	20 48	20 47
58	20 15	////	20 33	20 39	20 42	20 45
56	20 05	////	20 20	20 30	20 37	20 42
54	19 56	23 27	20 09	20 22	20 32	20 40
52	19 48	22 40	20 00	20 15	20 27	20 38
50	19 41	22 13	19 51	20 09	20 23	20 36
45	19 25	21 29	19 32	19 55	20 15	20 32
40	19 12	21 00	19 17	19 44	20 07	20 29
35	19 02	20 39	19 04	19 34	20 01	20 26
30	18 52	20 21	18 53	19 26	19 55	20 23
20	18 36	19 55	18 33	19 11	19 46	20 19
10	18 23	19 37	18 16	18 58	19 37	20 15
0	18 10	19 22	18 00	18 45	19 29	20 11
10	17 57	19 10	17 44	18 33	19 21	20 07
20	17 44	19 00	17 27	18 20	19 12	20 03
30	17 28	18 50	17 06	18 04	19 02	19 58
35	17 19	18 46	16 55	17 56	18 56	19 56
40	17 09	18 42	16 41	17 45	18 49	19 53
45	16 58	18 39	16 25	17 33	18 41	19 49
50	16 43	18 35	16 04	17 18	18 31	19 45
52	16 37	18 34	15 55	17 11	18 27	19 42
54	16 30	18 34	15 44	17 03	18 22	19 40
56	16 21	18 31	15 32	16 55	18 17	19 38
58	16 12	18 30	15 17	16 45	18 10	19 35
60 S	16 01	18 29	15 00	16 33	18 03	19 32

GCT h	Equation of Time (App.—Mean) 2 m s	3 m s	4 m s
0	− 6 14.2	− 6 10.5	− 6 06.1
6	− 6 13.3	− 6 09.4	− 6 04.9
12	− 6 12.4	− 6 08.3	− 6 03.7
18	− 6 11.5	− 6 07.2	− 6 02.4
24	− 6 10.5	− 6 06.1	− 6 01.1

GCT of Transit Meridian of Greenwich

DAY	Moon h m	Venus h m	Mars h m	Jupiter h m	Saturn h m
2	11 49	14 23	10 45	4 15	15 18
3	12 35	14 20	10 43	4 11	15 14
4	13 19	14 17	10 42	4 07	15 11
5	14 01	14 14	10 41	4 03	15 07

ADDITIONAL ALTITUDE CORRECTIONS

Alt. °	Sun's Low'r Limb ′	Venus ′	Mars ′
0	0.1	0.3	0.1
30	0.1	0.3	0.0
45	0.1	0.2	0.0
60	0.1	0.1	0.0
75	0.1	0.0	0.0
90			

Moon's Lower Limb
Add

Alt. °	2 ′	3 ′	4 ′
0	12.4	12.8	13.3
4	12.4	12.8	13.3
8	12.4	12.8	13.3
12	12.4	12.8	13.3
16	12.5	12.9	13.3
20	12.6	12.9	13.4
24	12.6	13.0	13.4
28	12.7	13.0	13.5
32	12.8	13.1	13.6
36	12.9	13.2	13.6
40	13.0	13.3	13.7
44	13.1	13.4	13.8
48	13.3	13.5	13.9
52	13.4	13.7	14.0
56	13.5	13.8	14.1
60	13.7	13.9	14.2
64	13.9	14.1	14.3
68	14.0	14.2	14.4
72	14.2	14.3	14.6
76	14.4	14.5	14.7
80	14.5	14.6	14.8
84	14.7	14.8	14.9
88	14.8	14.9	15.0
90			

Add to table, back cover

Moon's Upper Limb
Subtract

Alt. °	2 ′	3 ′	4 ′
0	17.4	17.2	16.9
4	17.4	17.1	16.8
8	17.3	17.1	16.8
12	17.3	17.1	16.8
16	17.2	17.0	16.8
20	17.2	17.0	16.7
24	17.1	16.9	16.7
28	17.0	16.9	16.6
32	16.9	16.8	16.6
36	16.8	16.7	16.5
40	16.7	16.6	16.4
44	16.6	16.5	16.3
48	16.5	16.4	16.2
52	16.3	16.2	16.1
56	16.2	16.1	16.0
60	16.0	16.0	15.9
64	15.9	15.8	15.8
68	15.7	15.7	15.7
72	15.6	15.6	15.6
76	15.4	15.4	15.4
80	15.2	15.3	15.3
84	15.0	15.1	15.2
88	14.9	15.0	15.1
90			

Subtract from table, back cover

New Moon 2

GCT	♈	VENUS −4.2		MARS 1.9		JUPITER −2.3		SATURN 1.3		MOON			
	GHA	GHA	Dec.	GHA	Dec.	GHA	Dec.	GHA	Dec.	GHA	code	Dec.	code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
0	312 44.3	146 05.9	+ 1 38.9	199 36.1	+22 38.8	299 07.2	+ 4 14.7	132 40.0	+ 2 21.6	155 43.7	152	+10 06.0	−140
1	327 46.8	161 07.9	38.1	214 36.8	38.6	314 09.7	14.7	147 42.3	21.5	170 17.9	152	9 52.0	−141
2	342 49.2	176 09.9	37.4	229 37.5	38.3	329 12.2	14.7	162 44.5	21.4	184 52.1	153	9 37.9	−141
3	357 51.7	191 11.9	·· 36.6	244 38.3	·· 38.1	344 14.6	·· 14.7	177 46.8	·· 21.3	199 26.4	152	· 9 23.8	−142
4	12 54.2	206 13.9	35.9	259 39.0	37.8	359 17.1	14.7	192 49.0	21.2	214 00.6	153	9 09.6	−142
5	27 56.6	221 15.9	35.2	274 39.7	37.6	14 19.6	14.7	207 51.3	21.1	228 34.9	153	8 55.4	−142
6	42 59.1	236 17.9	+ 1 34.4	289 40.4	+22 37.4	29 22.0	+ 4 14.6	222 53.5	+ 2 21.0	243 09.2	153	+ 8 41.2	−143
7	58 01.5	251 19.9	33.7	304 41.1	37.1	44 24.5	14.6	237 55.8	20.9	257 43.5	153	8 26.9	−144
8	73 04.0	266 21.9	33.0	319 41.8	36.9	59 27.0	14.6	252 58.0	20.8	272 17.8	154	8 12.5	−144
9	88 06.5	281 23.9	·· 32.2	334 42.5	·· 36.7	74 29.4	·· 14.6	268 00.2	·· 20.7	286 52.2	154	· 7 58.1	−144
10	103 08.9	296 25.9	31.5	349 43.3	36.4	89 31.9	14.6	283 02.5	20.6	301 26.6	153	7 43.7	−145
11	118 11.4	311 27.9	30.8	4 44.0	36.2	104 34.4	14.6	298 04.7	20.5	316 00.9	154	7 29.2	−145
12	133 13.9	326 29.9	+ 1 30.0	19 44.7	+22 35.9	119 36.8	+ 4 14.6	313 07.0	+ 2 20.4	330 35.3	154	+ 7 14.7	−145
13	148 16.3	341 31.9	29.3	34 45.4	35.7	134 39.3	14.5	328 09.2	20.3	345 09.7	154	7 00.2	−146
14	163 18.8	356 33.9	28.6	49 46.1	35.5	149 41.8	14.5	343 11.5	20.2	359 44.1	155	6 45.6	−146
15	178 21.3	11 36.0	·· 27.9	64 46.8	·· 35.2	164 44.2	·· 14.5	358 13.7	·· 20.1	14 18.6	154	· 6 31.0	−146
16	193 23.7	26 38.0	27.1	79 47.5	35.0	179 46.7	14.5	13 15.9	20.0	28 53.0	155	6 16.4	−147
17	208 26.2	41 40.0	26.4	94 48.3	34.7	194 49.2	14.5	28 18.2	19.9	43 27.5	154	6 01.7	−147
18	223 28.7	56 42.1	+ 1 25.7	109 49.0	+22 34.5	209 51.6	+ 4 14.5	43 20.4	+ 2 19.8	58 01.9	155	+ 5 47.0	−148
19	238 31.1	71 44.1	25.0	124 49.7	34.2	224 54.1	14.5	58 22.7	19.7	72 36.4	154	5 32.2	−148
20	253 33.6	86 46.1	24.3	139 50.4	34.0	239 56.6	14.4	73 24.9	19.6	87 10.8	155	5 17.4	−148
21	268 36.0	101 48.2	·· 23.5	154 51.1	·· 33.8	254 59.1	·· 14.4	88 27.2	·· 19.5	101 45.3	155	· 5 02.6	−148
22	283 38.5	116 50.2	22.8	169 51.8	33.5	270 01.5	14.4	103 29.4	19.4	116 19.8	154	4 47.8	−149
23	298 41.0	131 52.3	22.1	184 52.5	33.3	285 04.0	14.4	118 31.6	19.3	130 54.2	155	4 32.9	−149
0	313 43.4	146 54.3	+ 1 21.4	199 53.3	+22 33.0	300 06.5	+ 4 14.4	133 33.9	+ 2 19.2	145 28.7	155	+ 4 18.0	−149
1	328 45.9	161 56.4	20.7	214 54.0	32.8	315 09.0	14.4	148 36.1	19.1	160 03.2	154	4 03.1	−150
2	343 48.4	176 58.5	20.0	229 54.7	32.5	330 11.4	14.3	163 38.4	19.0	174 37.6	155	3 48.1	−150
3	358 50.8	192 00.5	·· 19.2	244 55.4	·· 32.3	345 13.9	·· 14.3	178 40.6	·· 18.9	189 12.1	155	· 3 33.1	−150
4	13 53.3	207 02.6	18.5	259 56.1	32.1	0 16.4	14.3	193 42.9	18.8	203 46.6	154	3 18.1	−150
5	28 55.8	222 04.7	17.8	274 56.8	31.8	15 18.8	14.3	208 45.1	18.7	218 21.0	155	3 03.1	−150
6	43 58.2	237 06.7	+ 1 17.1	289 57.6	+22 31.6	30 21.3	+ 4 14.3	223 47.3	+ 2 18.6	232 55.5	154	+ 2 48.1	−151
7	59 00.7	252 08.8	16.4	304 58.3	31.3	45 23.8	14.3	238 49.6	18.5	247 29.9	155	2 33.0	−151
8	74 03.2	267 10.9	15.7	319 59.0	31.1	60 26.3	14.2	253 51.8	18.4	262 04.4	154	2 17.9	−151
9	89 05.6	282 13.0	·· 15.0	334 59.7	·· 30.8	75 28.7	·· 14.2	268 54.1	·· 18.3	276 38.8	154	· 2 02.8	−151
10	104 08.1	297 15.1	14.3	350 00.4	30.6	90 31.2	14.2	283 56.3	18.2	291 13.2	154	1 47.7	−152
11	119 10.5	312 17.1	13.6	5 01.2	30.3	105 33.7	14.2	298 58.5	18.1	305 47.6	154	1 32.5	−151
12	134 13.0	327 19.2	+ 1 12.9	20 01.9	+22 30.1	120 36.2	+ 4 14.2	314 00.8	+ 2 18.0	320 22.0	154	+ 1 17.4	−152
13	149 15.5	342 21.3	12.2	35 02.6	29.8	135 38.6	14.1	329 03.0	17.9	334 56.4	154	1 02.2	−152
14	164 17.9	357 23.4	11.5	50 03.3	29.6	150 41.1	14.1	344 05.3	17.7	349 30.8	153	0 47.0	−152
15	179 20.4	12 25.5	·· 10.8	65 04.0	·· 29.4	165 43.6	·· 14.1	359 07.5	·· 17.6	4 05.1	153	· 0 31.8	−152
16	194 22.9	27 27.6	10.1	80 04.7	29.1	180 46.1	14.1	14 09.7	17.5	18 39.4	153	0 16.6	−153
17	209 25.3	42 29.7	09.4	95 05.5	28.9	195 48.6	14.1	29 12.0	17.4	33 13.7	153	+ 0 01.3	−152
18	224 27.8	57 31.9	+ 1 08.7	110 06.2	+22 28.6	210 51.0	+ 4 14.1	44 14.2	+ 2 17.3	47 48.0	153	− 0 13.9	−153
19	239 30.3	72 34.0	08.0	125 06.9	28.4	225 53.5	14.0	59 16.5	17.2	62 22.3	153	0 29.2	−152
20	254 32.7	87 36.1	07.3	140 07.6	28.1	240 56.0	14.0	74 18.7	17.1	76 56.6	152	0 44.4	−153
21	269 35.2	102 38.2	·· 06.6	155 08.3	·· 27.9	255 58.5	·· 14.0	89 21.0	·· 17.0	91 30.8	152	· 0 59.7	−153
22	284 37.6	117 40.3	05.9	170 09.1	27.6	271 01.0	14.0	104 23.2	16.9	106 05.0	152	1 15.0	−153
23	299 40.1	132 42.5	05.2	185 09.8	27.4	286 03.4	14.0	119 25.4	16.8	120 39.2	151	1 30.3	−153
0	314 42.6	147 44.6	+ 1 04.5	200 10.5	+22 27.1	301 05.9	+ 4 13.9	134 27.7	+ 2 16.7	135 13.3	151	− 1 45.6	−153
1	329 45.0	162 46.7	03.9	215 11.2	26.9	316 08.4	13.9	149 29.9	16.6	149 47.4	151	2 00.9	−153
2	344 47.5	177 48.9	03.2	230 11.9	26.6	331 10.9	13.9	164 32.2	16.5	164 21.5	151	2 16.2	−153
3	359 50.0	192 51.0	·· 02.5	245 12.7	·· 26.4	346 13.4	·· 13.9	179 34.4	·· 16.4	178 55.6	150	· 2 31.5	−153
4	14 52.4	207 53.2	01.8	260 13.4	26.1	1 15.8	13.9	194 36.6	16.3	193 29.6	150	2 46.8	−153
5	29 54.9	222 55.3	01.1	275 14.1	25.9	16 18.3	13.8	209 38.9	16.2	208 03.6	149	3 02.1	−153
6	44 57.4	237 57.5	+ 1 00.4	290 14.8	+22 25.6	31 20.8	+ 4 13.8	224 41.1	+ 2 16.1	222 37.5	150	− 3 17.4	−153
7	59 59.8	252 59.6	0 59.7	305 15.6	25.3	46 23.3	13.8	239 43.4	16.0	237 11.5	149	3 32.7	−153
8	75 02.3	268 01.8	59.1	320 16.3	25.1	61 25.8	13.8	254 45.6	15.9	251 45.4	148	3 48.0	−153
9	90 04.8	283 03.9	·· 58.4	335 17.0	·· 24.8	76 28.2	·· 13.8	269 47.8	·· 15.8	266 19.2	148	· 4 03.3	−152
10	105 07.2	298 06.1	57.7	350 17.7	24.6	91 30.7	13.7	284 50.1	15.7	280 53.0	148	4 18.5	−153
11	120 09.7	313 08.3	57.0	5 18.4	24.3	106 33.2	13.7	299 52.3	15.6	295 26.8	147	4 33.8	−153
12	135 12.1	328 10.4	+ 0 56.4	20 19.2	+22 24.1	121 35.7	+ 4 13.7	314 54.5	+ 2 15.5	310 00.5	147	− 4 49.1	−153
13	150 14.6	343 12.6	55.7	35 19.9	23.8	136 38.2	13.7	329 56.8	15.4	324 34.2	146	5 04.4	−152
14	165 17.1	358 14.8	55.0	50 20.6	23.6	151 40.7	13.7	344 59.0	15.3	339 07.8	146	5 19.6	−153
15	180 19.5	13 17.0	·· 54.3	65 21.3	·· 23.3	166 43.1	·· 13.6	0 01.3	·· 15.2	353 41.4	145	· 5 34.9	−152
16	195 22.0	28 19.2	53.7	80 22.1	23.1	181 45.6	13.6	15 03.5	15.1	8 14.9	145	5 50.1	−152
17	210 24.5	43 21.3	53.0	95 22.8	22.8	196 48.1	13.6	30 05.7	15.0	22 48.4	145	6 05.3	−152
18	225 26.9	58 23.5	+ 0 52.3	110 23.5	+22 22.5	211 50.6	+ 4 13.6	45 08.0	+ 2 14.9	37 21.9	144	− 6 20.5	−152
19	240 29.4	73 25.7	51.7	125 24.2	22.3	226 53.1	13.5	60 10.2	14.8	51 55.3	143	6 35.7	−152
20	255 31.9	88 27.9	51.0	140 25.0	22.0	241 55.6	13.5	75 12.5	14.7	66 28.6	143	6 50.9	−151
21	270 34.3	103 30.1	·· 50.3	155 25.7	·· 21.8	256 58.1	·· 13.5	90 14.7	·· 14.6	81 01.9	142	· 7 06.0	−152
22	285 36.8	118 32.3	49.7	170 26.4	21.5	272 00.6	13.5	105 16.9	14.5	95 35.1	142	7 21.2	−151
23	300 39.2	133 34.5	49.0	185 27.1	21.3	287 03.0	13.5	120 19.2	14.4	110 08.3	141	7 36.3	−151
24	315 41.7	148 36.8	+ 0 48.4	200 27.9	+22 21.0	302 05.5	+ 4 13.4	135 21.4	+ 2 14.2	124 41.4	141	− 7 51.4	−151
code	—	+ 21	− 7	+ 7	− 3	+ 24	− 1	+ 22	− 1				

GCT	SUN GHA	SUN Dec.
h	° ′	° ′
0	178 29.8	+17 15.7
1	193 29.8	15.0
2	208 29.9	14.3
3	223 29.9 ··	13.7
4	238 30.0	13.0
5	253 30.0	12.3
6	268 30.1	+17 11.7
7	283 30.1	11.0
8	298 30.2	10.3
9	313 30.3 ··	09.7
10	328 30.3	09.0
11	343 30.4	08.3
12	358 30.4	+17 07.7
13	13 30.5	07.0
14	28 30.6	06.3
15	43 30.6 ··	05.6
16	58 30.7	05.0
17	73 30.7	04.3
18	88 30.8	+17 03.6
19	103 30.8	03.0
20	118 30.9	02.3
21	133 31.0 ··	01.6
22	148 31.0	00.9
23	163 31.1	17 00.3
0	178 31.2	+16 59.6
1	193 31.2	58.9
2	208 31.3	58.2
3	223 31.3 ··	57.5
4	238 31.4	56.9
5	253 31.5	56.2
6	268 31.5	+16 55.5
7	283 31.6	54.8
8	298 31.7	54.2
9	313 31.7 ··	53.5
10	328 31.8	52.8
11	343 31.8	52.1
12	358 31.9	+16 51.4
13	13 32.0	50.7
14	28 32.0	50.1
15	43 32.1 ··	49.4
16	58 32.2	48.7
17	73 32.2	48.0
18	88 32.3	+16 47.3
19	103 32.4	46.6
20	118 32.4	46.0
21	133 32.5 ··	45.3
22	148 32.6	44.6
23	163 32.6	43.9
0	178 32.7	+16 43.2
1	193 32.8	42.5
2	208 32.8	41.8
3	223 32.9 ··	41.1
4	238 33.0	40.5
5	253 33.0	39.8
6	268 33.1	+16 39.1
7	283 33.2	38.4
8	298 33.3	37.7
9	313 33.3 ··	37.0
10	328 33.4	36.3
11	343 33.5	35.6
12	358 33.5	+16 34.9
13	13 33.6	34.2
14	28 33.7	33.5
15	43 33.8 ··	32.8
16	58 33.8	32.1
17	73 33.9	31.4
18	88 34.0	+16 30.8
19	103 34.0	30.1
20	118 34.1	29.4
21	133 34.2 ··	28.7
22	148 34.3	28.0
23	163 34.3	27.3
24	178 34.4	+16 26.6
code	—	−7

No.	STARS SHA	Dec.	Transit Mer. Gr.
	° ′	° ′	h m
1	358 31.5	+28 49.4	3 10
2	358 21.0	+58 52.8	3 11
3	349 42.3	−18 14.9	3 46
4	339 20.4	+59 58.9	4 27
5	336 00.8	−57 28.5	4 40
6	332 33.9	+89 02.0	4 54
7	328 53.3	+23 14.1	5 09
8	315 53.5	−40 29.5	6 01
9	309 47.2	+49 41.4	6 25
10	291 43.0	+16 25.0	7 37
11	281 57.0	− 8 15.1	8 16
12	281 43.5	+45 57.1	8 17
13	279 22.1	+ 6 18.7	8 26
14	279 11.7	+28 34.2	8 27
15	276 33.8	− 1 13.6	8 37
16	271 51.9	+ 7 24.2	8 56
17	264 17.3	−52 39.8	9 26
18	259 15.0	−16 38.6	9 47
19	255 49.4	−28 54.0	10 00
20	245 48.7	+ 5 21.2	10 40
21	244 24.9	+28 08.8	10 46
22	234 37.9	−59 21.0	11 25
23	223 27.3	−43 14.1	12 09
24	221 51.0	−69 31.0	12 16
25	218 42.1	− 8 26.7	12 28
26	208 33.2	+12 12.4	13 09
27	194 48.8	+62 01.0	14 04
28	183 21.2	+14 50.7	14 49
29	174 02.2	−62 50.1	15 26
30	172 53.4	−56 50.8	15 31
31	168 47.3	−59 25.7	15 47
32	167 01.4	+56 13.6	15 54
33	159 30.2	+55 10.9	16 24
34	159 20.5	−10 54.6	16 25
35	153 35.4	+49 33.5	16 48
36	149 02.7	−36 08.2	17 06
37	146 38.1	+19 26.1	17 16
38	140 55.7	−60 38.7	17 38
39	137 17.3	+74 21.4	17 53
40	126 50.2	+26 52.7	18 35
41	120 37.8	−22 29.3	18 59
42	113 23.2	−26 19.8	19 28
43	109 06.7	−68 56.9	19 45
44	103 05.7	−15 40.1	20 09
45	97 24.8	−37 04.4	20 32
46	96 49.4	+12 35.6	20 34
47	91 07.4	+51 29.7	20 57
48	84 45.1	−34 24.7	21 23
49	81 10.1	+38 44.3	21 37
50	76 55.6	−26 21.6	21 54
51	62 53.3	+ 8 44.4	22 50
52	54 31.7	−56 53.6	23 23
53	50 02.9	+45 06.4	23 41
54	34 32.5	+ 9 39.2	0 47
55	28 41.4	−47 11.7	1 10
56	16 14.8	−29 52.6	2 00
57	14 24.4	+14 56.7	2 07

Lat.	Sunrise	Twlt. begins	Moonrise 5	6	7	8
N °	h m	h m	h m	h m	h m	h m
70	1 59	////	6 10	8 09	10 06	12 13
68	2 36	////	6 21	8 11	10 01	11 58
66	3 01	////	6 30	8 13	9 56	11 45
64	3 21	////	6 38	8 15	9 53	11 35
62	3 37	////	6 44	8 16	9 49	11 27
60	3 51	////	6 50	8 18	9 47	11 19
58	4 02	////	6 55	8 19	9 44	11 13
56	4 12	////	6 59	8 20	9 42	11 07
54	4 20	1 01	7 03	8 21	9 40	11 02
52	4 28	1 40	7 06	8 22	9 38	10 57
50	4 35	2 05	7 10	8 23	9 37	10 53
45	4 50	2 47	7 16	8 24	9 33	10 44
40	5 02	3 14	7 22	8 26	9 30	10 37
35	5 12	3 36	7 27	8 27	9 28	10 31
30	5 21	3 52	7 31	8 28	9 26	10 25
20	5 37	4 17	7 39	8 30	9 22	10 16
10	5 50	4 36	7 45	8 32	9 19	10 08
0	6 02	4 51	7 51	8 33	9 16	10 00
10	6 15	5 02	7 57	8 35	9 13	9 52
20	6 28	5 12	8 03	8 36	9 10	9 44
30	6 42	5 21	8 11	8 38	9 06	9 35
35	6 51	5 25	8 15	8 39	9 04	9 30
40	7 00	5 28	8 19	8 41	9 02	9 24
45	7 11	5 32	8 25	8 42	8 59	9 18
50	7 25	5 34	8 31	8 44	8 56	9 09
52	7 31	5 36	8 34	8 45	8 55	9 06
54	7 38	5 37	8 38	8 46	8 53	9 02
56	7 46	5 38	8 41	8 46	8 52	8 57
58	7 54	5 39	8 45	8 48	8 50	8 52
60	8 04	5 40	8 50	8 49	8 48	8 47
S						

Lat.	Sunset	Twlt. ends	Moonset 5	6	7	8
N °	h m	h m	h m	h m	h m	h m
70	22 07	////	21 08	20 42	20 15	19 42
68	21 32	////	21 02	20 43	20 23	20 00
66	21 07	////	20 58	20 44	20 30	20 14
64	20 48	////	20 54	20 45	20 36	20 25
62	20 33	////	20 50	20 46	20 41	20 36
60	20 20	////	20 47	20 46	20 45	20 44
58	20 08	////	20 45	20 47	20 49	20 52
56	19 59	////	20 42	20 47	20 52	20 59
54	19 50	23 02	20 40	20 48	20 56	21 05
52	19 43	22 27	20 38	20 48	20 58	21 10
50	19 36	22 03	20 36	20 48	21 01	21 15
45	19 21	21 23	20 32	20 49	21 07	21 26
40	19 09	20 55	20 29	20 50	21 11	21 35
35	18 59	20 35	20 26	20 50	21 16	21 43
30	18 50	20 18	20 23	20 51	21 19	21 50
20	18 35	19 54	20 19	20 52	21 26	22 02
10	18 22	19 36	20 15	20 53	21 31	22 12
0	18 09	19 21	20 11	20 53	21 37	22 22
10	17 57	19 09	20 07	20 54	21 42	22 32
20	17 45	19 01	20 03	20 55	21 47	22 43
30	17 30	18 52	19 58	20 56	21 54	22 55
35	17 22	18 49	19 56	20 56	21 58	23 02
40	17 12	18 45	19 53	20 57	22 02	23 10
45	17 01	18 42	19 49	20 57	22 07	23 19
50	16 48	18 39	19 45	20 58	22 13	23 31
52	16 42	18 39	19 42	20 58	22 16	23 36
54	16 35	18 38	19 40	20 59	22 19	23 42
56	16 27	18 36	19 38	20 59	22 22	23 49
58	16 18	18 35	19 35	20 59	22 26	23 56
60	16 09	18 35	19 32	21 00	22 30	24 05
S						

Equation of Time (App.—Mean)

GCT	5	6	7
h	m s	m s	m s
0	− 6 01.1	− 5 55.5	− 5 49.3
6	− 5 59.8	− 5 54.0	− 5 47.7
12	− 5 58.4	− 5 52.5	− 5 46.0
18	− 5 57.0	− 5 50.9	− 5 44.3
24	− 5 55.5	− 5 49.3	− 5 42.5

GCT of Transit Meridian of Greenwich

DAY	Moon	Venus	Mars	Jupiter	Saturn
	h m	h m	h m	h m	h m
5	14 01	14 14	10 41	4 03	15 07
6	14 43	14 10	10 40	3 59	15 04
7	15 26	14 07	10 39	3 55	15 00
8	16 11	14 04	10 38	3 51	14 56

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb	Venus	Mars
°	′	′	′
0–30	0.1	0.3	0.1
30–45	0.1	0.3	0.0
45–60	0.1	0.2	0.0
60–75	0.1	0.1	0.0
75–90	0.1	0.0	0.0

Moon's Lower Limb *Add*

Alt.	5	6	7
°	′	′	′
0–4	13.9	14.4	15.2
4–8	13.9	14.4	15.2
8–12	13.9	14.4	15.2
12–16	13.9	14.4	15.2
16–20	14.0	14.4	15.2
20–24	14.0	14.5	15.2
24–28	14.0	14.5	15.2
28–32	14.1	14.5	15.2
32–36	14.1	14.6	15.2
36–40	14.2	14.6	15.2
40–44	14.2	14.6	15.2
44–48	14.3	14.7	15.3
48–52	14.4	14.7	15.3
52–56	14.4	14.8	15.3
56–60	14.5	14.8	15.3
60–64	14.6	14.9	15.3
64–68	14.7	14.9	15.3
68–72	14.8	15.0	15.4
72–76	14.8	15.1	15.4
76–80	14.9	15.1	15.4
80–84	15.0	15.2	15.4
84–88	15.1	15.2	15.4
88–90	15.2	15.3	15.5

Add to table, back cover

Moon's Upper Limb *Subtract*

Alt.	5	6	7
°	′	′	′
0–4	16.5	16.2	15.8
4–8	16.5	16.2	15.8
8–12	16.5	16.2	15.8
12–16	16.5	16.2	15.8
16–20	16.4	16.2	15.8
20–24	16.4	16.1	15.7
24–28	16.4	16.1	15.7
28–32	16.3	16.1	15.7
32–36	16.3	16.1	15.7
36–40	16.2	16.0	15.7
40–44	16.2	16.0	15.7
44–48	16.1	15.9	15.7
48–52	16.0	15.9	15.7
52–56	16.0	15.8	15.6
56–60	15.9	15.8	15.6
60–64	15.8	15.7	15.6
64–68	15.7	15.7	15.6
68–72	15.6	15.6	15.6
72–76	15.6	15.6	15.6
76–80	15.5	15.5	15.5
80–84	15.4	15.4	15.5
84–88	15.3	15.4	15.5
88–90	15.2	15.3	15.5

Subtract from table, back cover

GCT	♈ GHA	VENUS −4.1 GHA	VENUS Dec.	MARS 1.9 GHA	MARS Dec.	JUPITER −2.3 GHA	JUPITER Dec.	SATURN 1.3 GHA	SATURN Dec.	MOON GHA	code	MOON Dec.	code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
0	315 41.7	148 36.8	+ 0 48.4	200 27.9	+22 21.0	302 05.5	+ 4 13.4	135 21.4	+ 2 14.2	124 41.4	141	− 7 51.4	−151
1	330 44.2	163 39.0	47.7	215 28.6	20.8	317 08.0	13.4	150 23.6	14.1	139 14.5	140	8 06.5	−150
2	345 46.6	178 41.2	47.0	230 29.3	20.5	332 10.5	13.4	165 25.9	14.0	153 47.5	139	8 21.5	−151
3	0 49.1	193 43.4	·· 46.4	245 30.0	·· 20.2	347 13.0	·· 13.4	180 28.1	·· 13.9	168 20.4	139	· 8 36.6	−150
4	15 51.6	208 45.6	45.7	260 30.8	20.0	2 15.5	13.3	195 30.4	13.8	182 53.3	138	8 51.6	−150
5	30 54.0	223 47.9	45.1	275 31.5	19.7	17 18.0	13.3	210 32.6	13.7	197 26.1	137	9 06.6	−149
6	45 56.5	238 50.1	+ 0 44.4	290 32.2	+22 19.5	32 20.5	+ 4 13.3	225 34.8	+ 2 13.6	211 58.8	137	− 9 21.5	−149
7	60 59.0	253 52.3	43.8	305 32.9	19.2	47 23.0	13.3	240 37.1	13.5	226 31.5	136	9 36.4	−149
8	76 01.4	268 54.6	43.1	320 33.7	18.9	62 25.4	13.2	255 39.3	13.4	241 04.1	135	9 51.3	−149
9	91 03.9	283 56.8	·· 42.5	335 34.4	·· 18.7	77 27.9	·· 13.2	270 41.5	·· 13.3	255 36.6	135	·10 06.2	−148
10	106 06.4	298 59.1	41.8	350 35.1	18.4	92 30.4	13.2	285 43.8	13.2	270 09.1	134	10 21.0	−148
11	121 08.8	314 01.3	41.2	5 35.8	18.2	107 32.9	13.2	300 46.0	13.1	284 41.5	133	10 35.8	−148
12	136 11.3	329 03.6	+ 0 40.5	20 36.6	+22 17.9	122 35.4	+ 4 13.1	315 48.3	+ 2 13.0	299 13.8	133	−10 50.6	−147
13	151 13.7	344 05.8	39.9	35 37.3	17.6	137 37.9	13.1	330 50.5	12.9	313 46.1	131	11 05.3	−147
14	166 16.2	359 08.1	39.2	50 38.0	17.4	152 40.4	13.1	345 52.7	12.8	328 18.2	131	11 20.0	−146
15	181 18.7	14 10.3	·· 38.6	65 38.7	·· 17.1	167 42.9	·· 13.1	0 55.0	·· 12.7	342 50.3	130	·11 34.6	−146
16	196 21.1	29 12.6	37.9	80 39.5	16.9	182 45.4	13.0	15 57.2	12.6	357 22.3	130	11 49.2	−146
17	211 23.6	44 14.9	37.3	95 40.2	16.6	197 47.9	13.0	30 59.4	12.5	11 54.3	128	12 03.8	−145
18	226 26.1	59 17.1	+ 0 36.7	110 40.9	+22 16.3	212 50.4	+ 4 13.0	46 01.7	+ 2 12.4	26 26.1	128	−12 18.3	−145
19	241 28.5	74 19.4	36.0	125 41.7	16.1	227 52.9	13.0	61 03.9	12.3	40 57.9	127	12 32.8	−144
20	256 31.0	89 21.7	35.4	140 42.4	15.8	242 55.3	12.9	76 06.2	12.2	55 29.6	126	12 47.2	−144
21	271 33.5	104 24.0	·· 34.8	155 43.1	·· 15.5	257 57.8	·· 12.9	91 08.4	·· 12.1	70 01.2	125	·13 01.6	−143
22	286 35.9	119 26.3	34.1	170 43.8	15.3	273 00.3	12.9	106 10.6	12.0	84 32.7	124	13 15.9	−143
23	301 38.4	134 28.6	33.5	185 44.6	15.0	288 02.8	12.9	121 12.9	11.9	99 04.1	123	13 30.2	−142
0	316 40.9	149 30.9	+ 0 32.9	200 45.3	+22 14.7	303 05.3	+ 4 12.8	136 15.1	+ 2 11.8	113 35.4	123	−13 44.4	−142
1	331 43.3	164 33.2	32.2	215 46.0	14.5	318 07.8	12.8	151 17.3	11.7	128 06.7	121	13 58.6	−142
2	346 45.8	179 35.4	31.6	230 46.8	14.2	333 10.3	12.8	166 19.6	11.5	142 37.8	121	14 12.8	−140
3	1 48.2	194 37.8	·· 31.0	245 47.5	·· 14.0	348 12.8	·· 12.8	181 21.8	·· 11.4	157 08.9	120	·14 26.8	−140
4	16 50.7	209 40.1	30.4	260 48.2	13.7	3 15.3	12.7	196 24.0	11.3	171 39.9	118	14 40.8	−140
5	31 53.2	224 42.4	29.7	275 48.9	13.4	18 17.8	12.7	211 26.3	11.2	186 10.7	118	14 54.8	−139
6	46 55.6	239 44.7	+ 0 29.1	290 49.7	+22 13.2	33 20.3	+ 4 12.7	226 28.5	+ 2 11.1	200 41.5	117	−15 08.7	−138
7	61 58.1	254 47.0	28.5	305 50.4	12.9	48 22.8	12.7	241 30.7	11.0	215 12.2	116	15 22.5	−138
8	77 00.6	269 49.3	27.9	320 51.1	12.6	63 25.3	12.6	256 33.0	10.9	229 42.8	114	15 36.3	−137
9	92 03.0	284 51.6	·· 27.2	335 51.9	·· 12.4	78 27.8	·· 12.6	271 35.2	·· 10.8	244 13.2	114	·15 50.0	−136
10	107 05.5	299 54.0	26.6	350 52.6	12.1	93 30.3	12.6	286 37.5	10.7	258 43.6	113	16 03.6	−136
11	122 08.0	314 56.3	26.0	5 53.3	11.8	108 32.8	12.6	301 39.7	10.6	273 13.9	112	16 17.2	−135
12	137 10.4	329 58.6	+ 0 25.4	20 54.1	+22 11.6	123 35.3	+ 4 12.5	316 41.9	+ 2 10.5	287 44.1	111	−16 30.7	−134
13	152 12.9	345 01.0	24.8	35 54.8	11.3	138 37.8	12.5	331 44.2	10.4	302 14.2	109	16 44.1	−134
14	167 15.3	0 03.3	24.2	50 55.5	11.0	153 40.3	12.5	346 46.4	10.3	316 44.1	109	16 57.5	−133
15	182 17.8	15 05.7	·· 23.6	65 56.3	·· 10.8	168 42.8	·· 12.4	1 48.6	·· 10.2	331 14.0	107	·17 10.8	−132
16	197 20.3	30 08.0	22.9	80 57.0	10.5	183 45.3	12.4	16 50.9	10.1	345 43.7	107	17 24.0	−131
17	212 22.7	45 10.4	22.3	95 57.7	10.2	198 47.8	12.4	31 53.1	10.0	0 13.4	105	17 37.1	−131
18	227 25.2	60 12.7	+ 0 21.7	110 58.5	+22 09.9	213 50.3	+ 4 12.4	46 55.3	+ 2 09.9	14 42.9	104	−17 50.2	−130
19	242 27.7	75 15.1	21.1	125 59.2	09.7	228 52.8	12.3	61 57.6	09.8	29 12.3	104	18 03.2	−128
20	257 30.1	90 17.4	20.5	140 59.9	09.4	243 55.3	12.3	76 59.8	09.7	43 41.7	102	18 16.0	−129
21	272 32.6	105 19.8	·· 19.9	156 00.7	·· 09.1	258 57.8	·· 12.3	92 02.0	·· 09.6	58 10.9	100	·18 28.9	−127
22	287 35.1	120 22.2	19.3	171 01.4	08.9	274 00.3	12.2	107 04.3	09.5	72 39.9	100	18 41.6	−126
23	302 37.5	135 24.6	18.7	186 02.1	08.6	289 02.8	12.2	122 06.5	09.3	87 08.9	99	18 54.2	−126
0	317 40.0	150 26.9	+ 0 18.1	201 02.9	+22 08.3	304 05.3	+ 4 12.2	137 08.7	+ 2 09.2	101 37.8	97	−19 06.8	−124
1	332 42.5	165 29.3	17.5	216 03.6	08.1	319 07.8	12.2	152 11.0	09.1	116 06.5	96	19 19.2	−124
2	347 44.9	180 31.7	16.9	231 04.3	07.8	334 10.3	12.1	167 13.2	09.0	130 35.1	96	19 31.6	−122
3	2 47.4	195 34.1	·· 16.3	246 05.1	·· 07.5	349 12.8	·· 12.1	182 15.4	·· 08.9	145 03.7	93	·19 43.8	−122
4	17 49.8	210 36.5	15.7	261 05.8	07.2	4 15.3	12.1	197 17.7	08.8	159 32.0	93	19 56.0	−121
5	32 52.3	225 38.9	15.1	276 06.5	07.0	19 17.8	12.0	212 19.9	08.7	174 00.3	92	20 08.1	−120
6	47 54.8	240 41.3	+ 0 14.5	291 07.3	+22 06.7	34 20.3	+ 4 12.0	227 22.1	+ 2 08.6	188 28.5	90	−20 20.1	−118
7	62 57.2	255 43.7	14.0	306 08.0	06.4	49 22.8	12.0	242 24.4	08.5	202 56.5	89	20 31.9	−118
8	77 59.7	270 46.1	13.4	321 08.7	06.1	64 25.4	12.0	257 26.6	08.4	217 24.4	88	20 43.7	−117
9	93 02.2	285 48.5	·· 12.8	336 09.5	·· 05.9	79 27.9	·· 11.9	272 28.8	·· 08.3	231 52.2	87	·20 55.4	−116
10	108 04.6	300 50.9	12.2	351 10.2	05.6	94 30.4	11.9	287 31.1	08.2	246 19.9	85	21 07.0	−114
11	123 07.1	315 53.3	11.6	6 10.9	05.3	109 32.9	11.9	302 33.3	08.1	260 47.4	85	21 18.4	−114
12	138 09.6	330 55.7	+ 0 11.0	21 11.7	+22 05.0	124 35.4	+ 4 11.8	317 35.5	+ 2 08.0	275 14.9	83	−21 29.8	−112
13	153 12.0	345 58.2	10.4	36 12.4	04.8	139 37.9	11.8	332 37.8	07.9	289 42.2	81	21 41.0	−111
14	168 14.5	1 00.6	09.9	51 13.1	04.5	154 40.4	11.8	347 40.0	07.8	304 09.3	81	21 52.1	−110
15	183 17.0	16 03.0	·· 09.3	66 13.9	·· 04.2	169 42.9	·· 11.7	2 42.2	·· 07.7	318 36.4	79	·22 03.1	−109
16	198 19.4	31 05.4	08.7	81 14.6	03.9	184 45.4	11.7	17 44.5	07.6	333 03.3	78	22 14.0	−108
17	213 21.9	46 07.9	08.1	96 15.4	03.7	199 47.9	11.7	32 46.7	07.5	347 30.1	77	22 24.8	−106
18	228 24.3	61 10.3	+ 0 07.6	111 16.1	+22 03.4	214 50.4	+ 4 11.6	47 48.9	+ 2 07.3	1 56.8	76	−22 35.4	−105
19	243 26.8	76 12.8	07.0	126 16.8	03.1	229 52.9	11.6	62 51.2	07.2	16 23.4	74	22 45.9	−104
20	258 29.3	91 15.2	06.4	141 17.6	02.8	244 55.4	11.6	77 53.4	07.1	30 49.8	73	22 56.3	−103
21	273 31.7	106 17.7	·· 05.8	156 18.3	·· 02.6	259 58.0	·· 11.6	92 55.6	·· 07.0	45 16.1	72	·23 06.6	−102
22	288 34.2	121 20.1	05.3	171 19.0	02.3	275 00.5	11.5	107 57.9	06.9	59 42.3	70	23 16.8	−100
23	303 36.7	136 22.6	04.7	186 19.8	02.0	290 03.0	11.5	123 00.1	06.8	74 08.3	70	23 26.8	− 98
24	318 39.1	151 25.0	+ 0 04.1	201 20.5	+22 01.7	305 05.5	+ 4 11.5	138 02.3	+ 2 06.7	88 34.3	68	−23 36.6	− 98
code	—	+ 24	− 6	+ 7	− 3	+ 25	0	+ 23	− 1				

GCT	SUN GHA	SUN Dec.
h	° ′	° ′
0	178 34.4	+16 26.6
1	193 34.5	25.9
2	208 34.6	25.2
3	223 34.6 ··	24.5
4	238 34.7	23.8
5	253 34.8	23.1
6	268 34.9	+16 22.4
7	283 34.9	21.7
8	298 35.0	21.0
9	313 35.1 ··	20.3
10	328 35.2	19.6
11	343 35.2	18.9
12	358 35.3	+16 18.1
13	13 35.4	17.4
14	28 35.5	16.7
15	43 35.6 ··	16.0
16	58 35.6	15.3
17	73 35.7	14.6
18	88 35.8	+16 13.9
19	103 35.9	13.2
20	118 35.9	12.5
21	133 36.0 ··	11.8
22	148 36.1	11.1
23	163 36.2	10.4
0	178 36.3	+16 09.7
1	193 36.3	09.0
2	208 36.4	08.2
3	223 36.5 ··	07.5
4	238 36.6	06.8
5	253 36.7	06.1
6	268 36.8	+16 05.4
7	283 36.8	04.7
8	298 36.9	04.0
9	313 37.0 ··	03.3
10	328 37.1	02.5
11	343 37.2	01.8
12	358 37.3	+16 01.1
13	13 37.3	16 00.4
14	28 37.4	15 59.7
15	43 37.5 ··	59.0
16	58 37.6	58.3
17	73 37.7	57.5
18	88 37.8	+15 56.8
19	103 37.8	56.1
20	118 37.9	55.4
21	133 38.0 ··	54.7
22	148 38.1	53.9
23	163 38.2	53.2
0	178 38.3	+15 52.5
1	193 38.4	51.8
2	208 38.4	51.1
3	223 38.5 ··	50.3
4	238 38.6	49.6
5	253 38.7	48.9
6	268 38.8	+15 48.2
7	283 38.9	47.4
8	298 39.0	46.7
9	313 39.1 ··	46.0
10	328 39.2	45.3
11	343 39.2	44.6
12	358 39.3	+15 43.8
13	13 39.4	43.1
14	28 39.5	42.4
15	43 39.6 ··	41.6
16	58 39.7	40.9
17	73 39.8	40.2
18	88 39.9	+15 39.5
19	103 40.0	38.7
20	118 40.1	38.0
21	133 40.2 ··	37.3
22	148 40.2	36.5
23	163 40.3	35.8
24	178 40.4	+15 35.1
code	–	– 7

No.	STARS SHA	Dec.	Transit Mer. Gr.
	° ′	° ′	h m
1	358 31.5	+28 49.4	2 59
2	358 21.0	+58 52.9	2 59
3	349 42.3	−18 14.9	3 34
4	339 20.4	+59 59.0	4 15
5	336 00.8	−57 28.5	4 28
6	332 32.9	+89 02.0	4 42
7	328 53.3	+23 14.1	4 57
8	315 53.5	−40 29.4	5 49
9	309 47.2	+49 41.4	6 13
10	291 42.9	+16 25.0	7 25
11	281 56.9	− 8 15.1	8 04
12	281 43.5	+45 57.1	8 05
13	279 22.1	+ 6 18.7	8 14
14	279 11.7	+28 34.2	8 15
15	276 33.8	− 1 13.6	8 26
16	271 51.9	+ 7 24.2	8 44
17	264 17.3	−52 39.7	9 15
18	259 15.0	−16 38.6	9 35
19	255 49.4	−28 54.0	9 48
20	245 48.7	+ 5 21.2	10 28
21	244 24.8	+28 08.8	10 34
22	234 37.9	−59 21.0	11 13
23	223 27.3	−43 14.0	11 57
24	221 51.0	−69 31.0	12 04
25	218 42.1	− 8 26.7	12 16
26	208 33.2	+12 12.4	12 57
27	194 48.9	+62 01.0	13 52
28	183 21.2	+14 50.7	14 37
29	174 02.2	−62 50.1	15 15
30	172 53.5	−56 50.8	15 19
31	168 47.3	−59 25.7	15 36
32	167 01.4	+56 13.5	15 43
33	159 30.3	+55 10.9	16 13
34	159 20.5	−10 54.6	16 13
35	153 35.4	+49 33.5	16 36
36	149 02.7	−36 08.2	16 54
37	146 38.1	+19 26.1	17 04
38	140 55.7	−60 38.6	17 27
39	137 17.3	+74 21.4	17 41
40	126 50.3	+26 52.7	18 23
41	120 37.8	−22 29.3	18 48
42	113 23.2	−26 19.8	19 17
43	109 06.7	−68 56.9	19 34
44	103 05.7	−15 40.1	19 58
45	97 24.8	−37 04.5	20 20
46	96 49.4	+12 35.6	20 23
47	91 07.4	+51 29.7	20 45
48	84 45.2	−34 24.7	21 11
49	81 10.1	+38 44.3	21 25
50	76 55.6	−26 21.6	21 42
51	62 53.3	+ 8 44.4	22 38
52	54 31.7	−56 53.6	23 11
53	50 02.9	+45 06.4	23 29
54	34 32.5	+ 9 39.2	0 35
55	28 41.4	−47 11.7	0 58
56	16 14.8	−29 52.6	1 48
57	14 24.4	+14 56.7	1 55

GCT	Equation of Time (App.—Mean) 8	9	10
h	m s	m s	m s
0	− 5 42.5	− 5 35.1	− 5 27.1
6	− 5 40.7	− 5 33.1	− 5 25.0
12	− 5 38.9	− 5 31.1	− 5 22.8
18	− 5 37.0	− 5 29.1	− 5 20.7
24	− 5 35.1	− 5 27.1	− 5 18.5

Lat.	Sunrise	Twlt. begins	Moonrise 8	9	10	11
N °	h m	h m	h m	h m	h m	h m
70	2 18	////	12 13	14 50	■	■
68	2 50	////	11 58	14 12	■	■
66	3 13	////	11 45	13 47	16 20	■
64	3 31	////	11 35	13 27	15 36	■
62	3 45	////	11 27	13 11	15 07	17 18
60	3 58	////	11 19	12 58	14 45	16 38
58	4 08	////	11 13	12 47	14 27	16 10
56	4 18	////	11 07	12 37	14 12	15 49
54	4 26	1 20	11 02	12 28	13 59	15 31
52	4 33	1 51	10 57	12 20	13 47	15 16
50	4 39	2 14	10 53	12 13	13 38	15 03
45	4 53	2 52	10 44	11 59	13 17	14 36
40	5 05	3 19	10 37	11 47	13 00	14 15
35	5 15	3 39	10 31	11 37	12 46	13 58
30	5 23	3 55	10 25	11 28	12 34	13 43
20	5 38	4 18	10 16	11 13	12 13	13 18
10	5 50	4 36	10 08	11 00	11 55	12 56
0	6 02	4 50	10 00	10 47	11 39	12 36
10	6 14	5 02	9 52	10 35	11 22	12 16
20	6 26	5 12	9 44	10 22	11 05	11 54
30	6 40	5 19	9 35	10 08	10 45	11 30
35	6 48	5 23	9 30	9 59	10 34	11 15
40	6 57	5 26	9 24	9 50	10 20	10 59
45	7 07	5 29	9 18	9 39	10 05	10 39
50	7 20	5 31	9 09	9 25	9 46	10 15
52	7 26	5 32	9 06	9 19	9 37	10 03
54	7 32	5 32	9 02	9 12	9 27	9 49
56	7 40	5 33	8 57	9 05	9 16	9 34
58	7 48	5 34	8 52	8 56	9 03	9 16
60	7 57	5 35	8 47	8 47	8 48	8 53
S						

Lat.	Sunset	Twlt. ends	Moonset 8	9	10	11
N °	h m	h m	h m	h m	h m	h m
70	21 48	////	19 42	18 46	■	■
68	21 18	////	20 00	19 24	■	■
66	20 56	////	20 14	19 52	19 08	■
64	20 38	////	20 25	20 13	19 53	■
62	20 24	////	20 36	20 30	20 23	20 13
60	20 12	////	20 44	20 44	20 46	20 54
58	20 01	////	20 52	20 57	21 05	21 22
56	19 52	23 42	20 59	21 07	21 21	21 44
54	19 44	22 44	21 05	21 17	21 34	22 02
52	19 37	22 15	21 10	21 25	21 46	22 17
50	19 31	21 54	21 15	21 33	21 57	22 31
45	19 17	21 16	21 26	21 49	22 19	22 58
40	19 05	20 50	21 35	22 03	22 37	23 20
35	18 56	20 31	21 43	22 14	22 52	23 38
30	18 47	20 15	21 50	22 24	23 05	23 54
20	18 33	19 51	22 02	22 42	23 27	24 20
10	18 21	19 34	22 12	22 57	23 47	24 43
0	18 09	19 20	22 22	23 11	24 05	0 05
10	17 58	19 10	22 32	23 26	24 24	0 24
20	17 46	19 01	22 43	23 41	24 44	0 44
30	17 32	18 54	22 55	23 59	25 07	1 07
35	17 24	18 50	23 02	24 09	0 09	1 20
40	17 15	18 47	23 10	24 21	0 21	1 36
45	17 05	18 45	23 19	24 36	0 36	1 55
50	16 52	18 43	23 31	24 53	0 53	2 18
52	16 46	18 42	23 36	25 01	1 01	2 29
54	16 40	18 42	23 42	25 10	1 10	2 42
56	16 32	18 40	23 49	25 21	1 21	2 57
58	16 24	18 40	23 56	25 33	1 33	3 15
60	16 15	18 40	24 05	0 05	1 47	3 36
S						

GCT of Transit Meridian of Greenwich

DAY	Moon	Venus	Mars	Jupiter	Saturn
	h m	h m	h m	h m	h m
8	16 11	14 04	10 38	3 51	14 56
9	16 59	14 00	10 37	3 47	14 53
10	17 52	13 56	10 35	3 43	14 49
11	18 50	13 52	10 34	3 39	14 46

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb	Venus	Mars
°	′	′	′
0			
	0.1	0.4	0.1
30			
	0.1	0.3	0.0
45			
	0.1	0.2	0.0
60			
	0.1	0.1	0.0
75			
	0.1	0.0	0.0
90			

Moon's Lower Limb
Add

Alt.	8	9	10
°	′	′	′
0			
	15.9	16.7	17.6
4			
	15.9	16.7	17.6
8			
	15.9	16.7	17.6
12			
	15.9	16.7	17.5
16			
	15.9	16.7	17.5
20			
	15.9	16.6	17.5
24			
	15.9	16.6	17.4
28			
	15.9	16.6	17.4
32			
	15.9	16.5	17.3
36			
	15.9	16.5	17.2
40			
	15.9	16.5	17.2
44			
	15.8	16.4	17.1
48			
	15.8	16.4	17.0
52			
	15.8	16.3	16.9
56			
	15.8	16.3	16.8
60			
	15.8	16.2	16.7
64			
	15.8	16.2	16.6
68			
	15.7	16.1	16.5
72			
	15.7	16.0	16.4
76			
	15.7	16.0	16.3
80			
	15.7	15.9	16.2
84			
	15.7	15.9	16.1
88			
	15.6	15.8	16.0
90			

Add to table, back cover

Moon's Upper Limb
Subtract

Alt.	8	9	10
°	′	′	′
0			
	15.3	14.9	14.4
4			
	15.3	14.9	14.4
8			
	15.3	14.9	14.4
12			
	15.3	14.9	14.4
16			
	15.3	14.9	14.5
20			
	15.4	15.0	14.5
24			
	15.4	15.0	14.5
28			
	15.4	15.0	14.6
32			
	15.4	15.0	14.7
36			
	15.4	15.1	14.7
40			
	15.4	15.1	14.8
44			
	15.4	15.2	14.9
48			
	15.4	15.2	15.0
52			
	15.5	15.3	15.0
56			
	15.5	15.3	15.1
60			
	15.5	15.4	15.2
64			
	15.5	15.4	15.3
68			
	15.5	15.5	15.4
72			
	15.5	15.5	15.5
76			
	15.6	15.6	15.7
80			
	15.6	15.7	15.8
84			
	15.6	15.7	15.9
88			
	15.6	15.8	16.0
90			

Subtract from table, back cover

First Quarter 10

GCT	♈ GHA	VENUS −4.0 GHA	VENUS Dec.	MARS 1.9 GHA	MARS Dec.	JUPITER −2.3 GHA	JUPITER Dec.	SATURN 1.3 GHA	SATURN Dec.	MOON GHA	code	MOON Dec.	code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
0	318 39.1	151 25.0	+ 0 04.1	201 20.5	+22 01.7	305 05.5	+ 4 11.5	138 02.3	+ 2 06.7	88 34.3	68	−23 36.6	− 98
1	333 41.6	166 27.5	03.6	216 21.3	01.5	320 08.0	11.4	153 04.6	06.6	103 00.1	66	23 46.4	− 96
2	348 44.1	181 30.0	03.0	231 22.0	01.2	335 10.5	11.4	168 06.8	06.5	117 25.7	66	23 56.0	− 95
3	3 46.5	196 32.5	·· 02.5	246 22.7	·· 00.9	350 13.0	·· 11.4	183 09.0	·· 06.4	131 51.3	64	·24 05.5	− 93
4	18 49.0	211 34.9	01.9	261 23.5	00.6	5 15.5	11.3	198 11.3	06.3	146 16.7	63	24 14.8	− 92
5	33 51.5	226 37.4	01.3	276 24.2	00.3	20 18.0	11.3	213 13.5	06.2	160 42.0	62	24 24.0	− 91
6	48 53.9	241 39.9	+ 0 00.8	291 24.9	+22 00.1	35 20.6	+ 4 11.3	228 15.7	+ 2 06.1	175 07.2	61	−24 33.1	− 89
7	63 56.4	256 42.4	+ 0 00.2	306 25.7	21 59.8	50 23.1	11.2	243 17.9	06.0	189 32.3	59	24 42.0	− 87
8	78 58.8	271 44.9	− 0 00.3	321 26.4	59.5	65 25.6	11.2	258 20.2	05.9	203 57.2	58	24 50.7	− 86
9	94 01.3	286 47.4	·· 00.9	336 27.2	·· 59.2	80 28.1	·· 11.2	273 22.4	·· 05.8	218 22.0	57	·24 59.3	− 85
10	109 03.8	301 49.9	01.4	351 27.9	58.9	95 30.6	11.1	288 24.6	05.7	232 46.7	56	25 07.8	− 83
11	124 06.2	316 52.4	02.0	6 28.6	58.7	110 33.1	11.1	303 26.9	05.5	247 11.3	54	25 16.1	− 81
12	139 08.7	331 54.9	− 0 02.5	21 29.4	+21 58.4	125 35.6	+ 4 11.1	318 29.1	+ 2 05.4	261 35.7	54	−25 24.2	− 80
13	154 11.2	346 57.4	03.1	36 30.1	58.1	140 38.2	11.0	333 31.3	05.3	276 00.1	52	25 32.2	− 79
14	169 13.6	1 59.9	03.6	51 30.9	57.8	155 40.7	11.0	348 33.6	05.2	290 24.3	51	25 40.1	− 77
15	184 16.1	17 02.4	·· 04.2	66 31.6	·· 57.5	170 43.2	·· 11.0	3 35.8	·· 05.1	304 48.4	50	·25 47.8	− 75
16	199 18.6	32 04.9	04.7	81 32.3	57.3	185 45.7	10.9	18 38.0	05.0	319 12.4	48	25 55.3	− 73
17	214 21.0	47 07.5	05.3	96 33.1	57.0	200 48.2	10.9	33 40.3	04.9	333 36.2	48	26 02.6	− 72
18	229 23.5	62 10.0	− 0 05.8	111 33.8	+21 56.7	215 50.7	+ 4 10.9	48 42.5	+ 2 04.8	348 00.0	46	−26 09.8	− 70
19	244 25.9	77 12.5	06.3	126 34.6	56.4	230 53.3	10.8	63 44.7	04.7	2 23.6	46	26 16.8	− 69
20	259 28.4	92 15.0	06.9	141 35.3	56.1	245 55.8	10.8	78 46.9	04.6	16 47.2	44	26 23.7	− 67
21	274 30.9	107 17.6	·· 07.4	156 36.1	·· 55.8	260 58.3	·· 10.8	93 49.2	·· 04.5	31 10.6	43	·26 30.4	− 65
22	289 33.3	122 20.1	07.9	171 36.8	55.6	276 00.8	10.7	108 51.4	04.4	45 33.9	42	26 36.9	− 63
23	304 35.8	137 22.7	08.5	186 37.5	55.3	291 03.3	10.7	123 53.6	04.3	59 57.1	41	26 43.2	− 62
0	319 38.3	152 25.2	− 0 09.0	201 38.3	+21 55.0	306 05.8	+ 4 10.6	138 55.9	+ 2 04.2	74 20.2	40	−26 49.4	− 60
1	334 40.7	167 27.8	09.5	216 39.0	54.7	321 08.4	10.6	153 58.1	04.1	88 43.2	39	26 55.4	− 58
2	349 43.2	182 30.3	10.1	231 39.8	54.4	336 10.9	10.6	169 00.3	04.0	103 06.1	38	27 01.2	− 56
3	4 45.7	197 32.9	·· 10.6	246 40.5	·· 54.1	351 13.4	·· 10.5	184 02.6	·· 03.8	117 28.9	37	·27 06.8	− 54
4	19 48.1	212 35.4	11.1	261 41.2	53.8	6 15.9	10.5	199 04.8	03.7	131 51.6	36	27 12.2	− 53
5	34 50.6	227 38.0	11.6	276 42.0	53.6	21 18.4	10.5	214 07.0	03.6	146 14.2	35	27 17.5	− 51
6	49 53.1	242 40.6	− 0 12.1	291 42.7	+21 53.3	36 21.0	+ 4 10.4	229 09.2	+ 2 03.5	160 36.7	34	−27 22.6	− 49
7	64 55.5	257 43.2	12.7	306 43.5	53.0	51 23.5	10.4	244 11.5	03.4	174 59.1	33	27 27.5	− 47
8	79 58.0	272 45.7	13.2	321 44.2	52.7	66 26.0	10.4	259 13.7	03.3	189 21.4	32	27 32.2	− 45
9	95 00.4	287 48.3	·· 13.7	336 45.0	·· 52.4	81 28.5	·· 10.3	274 15.9	·· 03.2	203 43.6	32	·27 36.7	− 43
10	110 02.9	302 50.9	14.2	351 45.7	52.1	96 31.0	10.3	289 18.2	03.1	218 05.8	30	27 41.0	− 41
11	125 05.4	317 53.5	14.7	6 46.5	51.8	111 33.6	10.3	304 20.4	03.0	232 27.8	30	27 45.1	− 40
12	140 07.8	332 56.1	− 0 15.2	21 47.2	+21 51.5	126 36.1	+ 4 10.2	319 22.6	+ 2 02.9	246 49.8	29	−27 49.1	− 37
13	155 10.3	347 58.7	15.8	36 47.9	51.3	141 38.6	10.2	334 24.9	02.8	261 11.7	28	27 52.8	− 36
14	170 12.8	3 01.3	16.3	51 48.7	51.0	156 41.1	10.1	349 27.1	02.7	275 33.5	28	27 56.4	− 33
15	185 15.2	18 03.9	·· 16.8	66 49.4	·· 50.7	171 43.7	·· 10.1	4 29.3	·· 02.6	289 55.3	27	·27 59.7	− 32
16	200 17.7	33 06.5	17.3	81 50.2	50.4	186 46.2	10.1	19 31.5	02.5	304 17.0	26	28 02.9	− 29
17	215 20.2	48 09.1	17.8	96 50.9	50.1	201 48.7	10.0	34 33.8	02.3	318 38.6	25	28 05.8	− 28
18	230 22.6	63 11.7	− 0 18.3	111 51.7	+21 49.8	216 51.2	+ 4 10.0	49 36.0	+ 2 02.2	333 00.1	25	−28 08.6	− 25
19	245 25.1	78 14.3	18.8	126 52.4	49.5	231 53.8	10.0	64 38.2	02.1	347 21.6	24	28 11.1	− 24
20	260 27.6	93 17.0	19.3	141 53.2	49.2	246 56.3	09.9	79 40.5	02.0	1 43.0	23	28 13.5	− 21
21	275 30.0	108 19.6	·· 19.8	156 53.9	·· 48.9	261 58.8	·· 09.9	94 42.7	·· 01.9	16 04.3	23	·28 15.6	− 20
22	290 32.5	123 22.2	20.3	171 54.7	48.7	277 01.3	09.8	109 44.9	01.8	30 25.6	23	28 17.6	− 17
23	305 34.9	138 24.9	20.8	186 55.4	48.4	292 03.9	09.8	124 47.1	01.7	44 46.9	22	28 19.3	− 16
0	320 37.4	153 27.5	− 0 21.3	201 56.2	+21 48.1	307 06.4	+ 4 09.8	139 49.4	+ 2 01.6	59 08.1	21	−28 20.9	− 13
1	335 39.9	168 30.1	21.8	216 56.9	47.8	322 08.9	09.7	154 51.6	01.5	73 29.2	21	28 22.2	− 11
2	350 42.3	183 32.8	22.2	231 57.6	47.5	337 11.4	09.7	169 53.8	01.4	87 50.3	21	28 23.3	− 9
3	5 44.8	198 35.4	·· 22.7	246 58.4	·· 47.2	352 14.0	·· 09.7	184 56.0	·· 01.3	102 11.4	20	·28 24.2	− 7
4	20 47.3	213 38.1	23.2	261 59.1	46.9	7 16.5	09.6	199 58.3	01.2	116 32.4	20	28 24.9	− 5
5	35 49.7	228 40.7	23.7	276 59.9	46.6	22 19.0	09.6	215 00.5	01.1	130 53.4	19	28 25.4	− 3
6	50 52.2	243 43.4	− 0 24.2	292 00.6	+21 46.3	37 21.5	+ 4 09.5	230 02.7	+ 2 01.0	145 14.3	20	−28 25.7	− 1
7	65 54.7	258 46.0	24.7	307 01.4	46.0	52 24.1	09.5	245 05.0	00.8	159 35.3	18	28 25.8	+ 2
8	80 57.1	273 48.7	25.2	322 02.1	45.7	67 26.6	09.5	260 07.2	00.7	173 56.1	19	28 25.6	+ 3
9	95 59.6	288 51.4	·· 25.6	337 02.9	·· 45.4	82 29.1	·· 09.4	275 09.4	·· 00.6	188 17.0	19	·28 25.3	+ 5
10	111 02.1	303 54.1	26.1	352 03.6	45.1	97 31.7	09.4	290 11.6	00.5	202 37.9	18	28 24.8	+ 8
11	126 04.5	318 56.7	26.6	7 04.4	44.9	112 34.2	09.3	305 13.9	00.4	216 58.7	19	28 24.0	+ 10
12	141 07.0	333 59.4	− 0 27.1	22 05.1	+21 44.6	127 36.7	+ 4 09.3	320 16.1	+ 2 00.3	231 19.6	18	−28 23.0	+ 12
13	156 09.4	349 02.1	27.5	37 05.9	44.3	142 39.2	09.3	335 18.3	00.2	245 40.4	18	28 21.8	+ 14
14	171 11.9	4 04.8	28.0	52 06.6	44.0	157 41.8	09.2	350 20.5	00.1	260 01.2	18	28 20.4	+ 16
15	186 14.4	19 07.5	·· 28.5	67 07.4	·· 43.7	172 44.3	·· 09.2	5 22.8	· 2 00.0	274 22.0	18	·28 18.8	+ 18
16	201 16.8	34 10.2	28.9	82 08.1	43.4	187 46.8	09.1	20 25.0	1 59.9	288 42.8	18	28 17.0	+ 21
17	216 19.3	49 12.9	29.4	97 08.9	43.1	202 49.4	09.1	35 27.2	59.8	303 03.6	18	28 14.9	+ 22
18	231 21.8	64 15.6	− 0 29.9	112 09.6	+21 42.8	217 51.9	+ 4 09.1	50 29.5	+ 1 59.7	317 24.4	18	−28 12.7	+ 25
19	246 24.2	79 18.3	30.3	127 10.4	42.5	232 54.4	09.0	65 31.7	59.6	331 45.2	19	28 10.2	+ 26
20	261 26.7	94 21.0	30.8	142 11.1	42.2	247 57.0	09.0	80 33.9	59.4	346 06.1	18	28 07.6	+ 29
21	276 29.2	109 23.7	·· 31.3	157 11.9	·· 41.9	262 59.5	·· 08.9	95 36.1	·· 59.3	0 26.9	19	·28 04.7	+ 31
22	291 31.6	124 26.4	31.7	172 12.6	41.6	278 02.0	08.9	110 38.4	59.2	14 47.8	19	28 01.6	+ 33
23	306 34.1	139 29.1	32.2	187 13.4	41.3	293 04.6	08.9	125 40.6	59.1	29 08.7	19	27 58.3	+ 35
24	321 36.6	154 31.9	− 0 32.6	202 14.1	+21 41.0	308 07.1	+ 4 08.8	140 42.8	+ 1 59.0	43 29.6	19	−27 54.8	+ 38
code	—	+ 26	− 6	+ 7	− 2	+ 25	0	+ 23	− 1				

GCT h	SUN GHA ° ′	SUN Dec. ° ′
0	178 40.4	+15 35.1
1	193 40.5	34.4
2	208 40.6	33.6
3	223 40.7	·· 32.9
4	238 40.8	32.2
5	253 40.9	31.4
6	268 41.0	+15 30.7
7	283 41.1	30.0
8	298 41.2	29.2
9	313 41.3	·· 28.5
10	328 41.4	27.8
11	343 41.5	27.0
12	358 41.6	+15 26.3
13	13 41.7	25.6
14	28 41.8	24.8
15	43 41.9	·· 24.1
16	58 42.0	23.3
17	73 42.1	22.6
18	88 42.1	+15 21.9
19	103 42.2	21.1
20	118 42.3	20.4
21	133 42.4	·· 19.6
22	148 42.5	18.9
23	163 42.6	18.2
0	178 42.7	+15 17.4
1	193 42.8	16.7
2	208 42.9	15.9
3	223 43.0	·· 15.2
4	238 43.1	14.5
5	253 43.2	13.7
6	268 43.3	+15 13.0
7	283 43.4	12.2
8	298 43.5	11.5
9	313 43.6	·· 10.7
10	328 43.7	10.0
11	343 43.8	09.2
12	358 43.9	+15 08.5
13	13 44.0	07.8
14	28 44.2	07.0
15	43 44.3	·· 06.3
16	58 44.4	05.5
17	73 44.5	04.8
18	88 44.6	+15 04.0
19	103 44.7	03.3
20	118 44.8	02.5
21	133 44.9	·· 01.8
22	148 45.0	01.0
23	163 45.1	15 00.3
0	178 45.2	+14 59.5
1	193 45.3	58.8
2	208 45.4	58.0
3	223 45.5	·· 57.3
4	238 45.6	56.5
5	253 45.7	55.8
6	268 45.8	+14 55.0
7	283 45.9	54.3
8	298 46.0	53.5
9	313 46.1	·· 52.7
10	328 46.3	52.0
11	343 46.4	51.2
12	358 46.5	+14 50.5
13	13 46.6	49.7
14	28 46.7	49.0
15	43 46.8	·· 48.2
16	58 46.9	47.5
17	73 47.0	46.7
18	88 47.1	+14 45.9
19	103 47.2	45.2
20	118 47.3	44.4
21	133 47.5	·· 43.7
22	148 47.6	42.9
23	163 47.7	42.1
24	178 47.8	+14 41.4
code	—	− 7

STARS No.	SHA ° ′	Dec. ° ′	Transit Mer. Gr. h m
1	358 31.5	+28 49.4	2 47
2	358 21.0	+58 52.9	2 48
3	349 42.2	−18 14.9	3 22
4	339 20.4	+59 59.0	4 03
5	336 00.8	−57 28.5	4 17
6	332 31.9	+89 02.0	4 31
7	328 53.3	+23 14.2	4 45
8	315 53.4	−40 29.4	5 37
9	309 47.2	+49 41.4	6 01
10	291 42.9	+16 25.0	7 13
11	281 56.9	− 8 15.1	7 52
12	281 43.5	+45 57.1	7 53
13	279 22.1	+ 6 18.7	8 03
14	279 11.6	+28 34.2	8 03
15	276 33.7	− 1 13.6	8 14
16	271 51.8	+ 7 24.2	8 33
17	264 17.2	−52 39.7	9 03
18	259 15.0	−16 38.6	9 23
19	255 49.4	−28 54.0	9 37
20	245 48.7	+ 5 21.2	10 17
21	244 24.8	+28 08.8	10 22
22	234 37.9	−59 21.0	11 01
23	223 27.3	−43 14.0	11 46
24	221 51.0	−69 31.0	11 52
25	218 42.1	− 8 26.7	12 05
26	208 33.2	+12 12.4	12 45
27	194 48.9	+62 00.9	13 40
28	183 21.2	+14 50.7	14 26
29	174 02.2	−62 50.1	15 03
30	172 53.5	−56 50.8	15 07
31	168 47.3	−59 25.7	15 24
32	167 01.4	+56 13.5	15 31
33	159 30.3	+55 10.9	16 01
34	159 20.5	−10 54.6	16 01
35	153 35.4	+49 33.5	16 24
36	149 02.7	−36 08.2	16 43
37	146 38.2	+19 26.1	16 52
38	140 55.8	−60 38.6	17 15
39	137 17.4	+74 21.4	17 29
40	126 50.3	+26 52.7	18 11
41	120 37.8	−22 29.3	18 36
42	113 23.2	−26 19.8	19 05
43	109 06.7	−68 56.9	19 22
44	103 05.7	−15 40.1	19 46
45	97 24.8	−37 04.5	20 08
46	96 49.4	+12 35.6	20 11
47	91 07.4	+51 29.7	20 34
48	84 45.2	−34 24.7	20 59
49	81 10.1	+38 44.3	21 13
50	76 55.6	−26 21.6	21 30
51	62 53.3	+ 8 44.4	22 26
52	54 31.7	−56 53.6	23 00
53	50 02.9	+45 06.4	23 17
54	34 32.5	+ 9 39.2	0 23
55	28 41.4	−47 11.7	0 47
56	16 14.8	−29 52.6	1 36
57	14 24.4	+14 56.7	1 44

Lat.	Sunrise	Twlt. begins	Moonrise 11	12	13	14
N °	h m	h m	h m	h m	h m	h m
70	2 36	////	■	■	■	■
68	3 03	////	■	■	■	■
66	3 24	////	■	■	■	■
64	3 40	////	■	■	■	21 48
62	3 53	////	17 18	■	■	20 28
60	4 05	////	16 38	18 25	19 30	19 51
58	4 15	////	16 10	17 45	18 52	19 25
56	4 23	0 52	15 49	17 18	18 24	19 04
54	4 31	1 36	15 31	16 56	18 03	18 47
52	4 38	2 02	15 16	16 38	17 45	18 32
50	4 44	2 22	15 03	16 23	17 30	18 19
45	4 57	2 58	14 36	15 52	16 59	17 52
40	5 08	3 23	14 15	15 29	16 35	17 30
35	5 17	3 42	13 58	15 09	16 15	17 13
30	5 25	3 57	13 43	14 52	15 58	16 57
20	5 39	4 20	13 18	14 24	15 30	16 31
10	5 51	4 38	12 56	14 00	15 05	16 09
0	6 02	4 51	12 36	13 38	14 43	15 48
10	6 13	5 01	12 16	13 15	14 20	15 26
20	6 24	5 10	11 54	12 51	13 55	15 04
30	6 37	5 17	11 30	12 24	13 27	14 37
35	6 45	5 20	11 15	12 07	13 10	14 22
40	6 53	5 22	10 59	11 48	12 50	14 04
45	7 03	5 24	10 39	11 25	12 26	13 42
50	7 15	5 26	10 15	10 56	11 56	13 14
52	7 20	5 27	10 03	10 42	11 40	13 00
54	7 27	5 27	9 49	10 25	11 23	12 44
56	7 33	5 27	9 34	10 05	11 01	12 25
58	7 41	5 28	9 16	9 41	10 34	12 02
60	7 49	5 28	8 53	9 09	9 55	11 32
S						

Lat.	Sunset	Twlt. ends	Moonset 11	12	13	14
N °	h m	h m	h m	h m	h m	h m
70	21 30	////	■	■	■	■
68	21 04	////	■	■	■	■
66	20 44	////	■	■	■	■
64	20 28	////	■	■	■	22 28
62	20 15	////	20 13	■	■	23 48
60	20 04	////	20 54	21 18	22 30	24 24
58	19 54	////	21 22	21 58	23 09	24 50
56	19 45	23 07	21 44	22 25	23 36	25 10
54	19 38	22 28	22 02	22 47	23 57	25 27
52	19 31	22 03	22 17	23 05	24 14	0 14
50	19 25	21 44	22 31	23 20	24 29	0 29
45	19 12	21 09	22 58	23 51	25 00	1 00
40	19 02	20 45	23 20	24 15	0 15	1 23
35	18 53	20 27	23 38	24 35	0 35	1 43
30	18 45	20 12	23 54	24 52	0 52	1 59
20	18 31	19 49	24 20	0 20	1 21	2 27
10	18 19	19 32	24 43	0 43	1 45	2 51
0	18 08	19 19	0 05	1 05	2 08	3 14
10	17 58	19 10	0 24	1 26	2 31	3 36
20	17 46	19 01	0 44	1 49	2 56	4 00
30	17 33	18 54	1 07	2 16	3 24	4 27
35	17 26	18 52	1 20	2 32	3 41	4 43
40	17 18	18 50	1 36	2 50	4 01	5 02
45	17 08	18 48	1 55	3 13	4 25	5 25
50	16 56	18 46	2 18	3 41	4 55	5 53
52	16 51	18 46	2 29	3 55	5 11	6 07
54	16 45	18 46	2 42	4 12	5 28	6 23
56	16 38	18 45	2 57	4 31	5 50	6 43
58	16 30	18 45	3 15	4 55	6 17	7 06
60	16 22	18 46	3 36	5 27	6 56	7 37
S						

GCT h	Equation of Time (App.—Mean) 11 m s	12 m s	13 m s
0	− 5 18.5	− 5 09.3	− 4 59.5
6	− 5 16.2	− 5 06.9	− 4 56.9
12	− 5 13.9	− 5 04.4	− 4 54.3
18	− 5 11.6	− 5 02.0	− 4 51.7
24	− 5 09.3	− 4 59.5	− 4 49.1

GCT of Transit Meridian of Greenwich

DAY	Moon h m	Venus h m	Mars h m	Jupiter h m	Saturn h m
11	18 50	13 52	10 34	3 39	14 46
12	19 53	13 48	10 33	3 35	14 42
13	20 58	13 44	10 32	3 31	14 39
14	22 03	13 39	10 31	3 27	14 35

ADDITIONAL ALTITUDE CORRECTIONS

Alt. °	Sun's Low'r Limb ′	Venus ′	Mars ′
0			
	0.1	0.4	0.1
30			
	0.1	0.3	0.0
45			
	0.1	0.2	0.0
60			
	0.1	0.2	0.0
75			
	0.1	0.1	0.0
90			

Moon's Lower Limb

Add

Alt. °	11 ′	12 ′	13 ′
0			
	18.3	19.1	19.6
4			
	18.3	19.1	19.6
8			
	18.3	19.1	19.6
12			
	18.3	19.0	19.5
16			
	18.2	19.0	19.5
20			
	18.2	18.9	19.4
24			
	18.1	18.8	19.3
28			
	18.1	18.7	19.2
32			
	18.0	18.6	19.1
36			
	17.9	18.5	18.9
40			
	17.8	18.4	18.8
44			
	17.7	18.3	18.6
48			
	17.6	18.1	18.5
52			
	17.4	18.0	18.3
56			
	17.3	17.8	18.1
60			
	17.2	17.6	17.9
64			
	17.0	17.5	17.7
68			
	16.9	17.3	17.5
72			
	16.8	17.1	17.3
76			
	16.6	16.9	17.1
80			
	16.5	16.7	16.9
84			
	16.3	16.5	16.6
88			
	16.2	16.4	16.5
90			

Add to table, back cover

Moon's Upper Limb

Subtract

Alt. °	11 ′	12 ′	13 ′
0			
	14.0	13.5	13.2
4			
	14.0	13.5	13.2
8			
	14.0	13.6	13.3
12			
	14.0	13.6	13.3
16			
	14.1	13.6	13.4
20			
	14.1	13.7	13.5
24			
	14.2	13.8	13.5
28			
	14.2	13.9	13.6
32			
	14.3	14.0	13.8
36			
	14.4	14.1	13.9
40			
	14.5	14.2	14.0
44			
	14.6	14.4	14.2
48			
	14.7	14.5	14.4
52			
	14.9	14.7	14.5
56			
	15.0	14.8	14.7
60			
	15.1	15.0	14.9
64			
	15.3	15.2	15.1
68			
	15.4	15.4	15.3
72			
	15.5	15.5	15.5
76			
	15.7	15.7	15.8
80			
	15.8	15.9	16.0
84			
	16.0	16.1	16.2
88			
	16.1	16.3	16.4
90			

Subtract from table, back cover

GCT	♈ GHA	VENUS −4.0 GHA	Dec.	MARS 1.9 GHA	Dec.	JUPITER −2.3 GHA	Dec.	SATURN 1.3 GHA	Dec.	MOON GHA	code	Dec.	code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
0	321 36.6	154 31.9	− 0 32.6	202 14.1	+21 41.0	308 07.1	+ 4 08.8	140 42.8	+ 1 59.0	43 29.6	19	−27 54.8	+ 38
1	336 39.0	169 34.6	33.1	217 14.9	40.7	323 09.6	08.8	155 45.0	58.9	57 50.5	20	27 51.0	+ 39
2	351 41.5	184 37.3	33.5	232 15.6	40.4	338 12.2	08.7	170 47.3	58.8	72 11.5	20	27 47.1	+ 41
3	6 43.9	199 40.1	·· 34.0	247 16.4	·· 40.1	353 14.7	·· 08.7	185 49.5	·· 58.7	86 32.5	21	·27 43.0	+ 44
4	21 46.4	214 42.8	34.4	262 17.1	39.8	8 17.2	08.6	200 51.7	58.6	100 53.6	21	27 38.6	+ 45
5	36 48.9	229 45.6	34.9	277 17.9	39.5	23 19.8	08.6	215 53.9	58.5	115 14.7	21	27 34.1	+ 48
6	51 51.3	244 48.3	− 0 35.3	292 18.6	+21 39.2	38 22.3	+ 4 08.6	230 56.2	+ 1 58.4	129 35.8	22	−27 29.3	+ 50
7	66 53.8	259 51.1	35.8	307 19.4	38.9	53 24.8	08.5	245 58.4	58.3	143 57.0	22	27 24.3	+ 51
8	81 56.3	274 53.8	36.2	322 20.1	38.6	68 27.4	08.5	261 00.6	58.1	158 18.2	22	27 19.2	+ 54
9	96 58.7	289 56.6	·· 36.6	337 20.9	·· 38.3	83 29.9	·· 08.4	276 02.8	·· 58.0	172 39.4	24	·27 13.8	+ 56
10	112 01.2	304 59.3	37.1	352 21.7	38.0	98 32.4	08.4	291 05.1	57.9	187 00.8	24	27 08.2	+ 58
11	127 03.7	320 02.1	37.5	7 22.4	37.7	113 35.0	08.3	306 07.3	57.8	201 22.2	24	27 02.4	+ 59
12	142 06.1	335 04.9	− 0 37.9	22 23.2	+21 37.4	128 37.5	+ 4 08.3	321 09.5	+ 1 57.7	215 43.6	25	−26 56.5	+ 62
13	157 08.6	350 07.6	38.4	37 23.9	37.1	143 40.1	08.3	336 11.7	57.6	230 05.1	26	26 50.3	+ 64
14	172 11.0	5 10.4	38.8	52 24.7	36.8	158 42.6	08.2	351 14.0	57.5	244 26.7	26	26 43.9	+ 66
15	187 13.5	20 13.2	·· 39.2	67 25.4	·· 36.5	173 45.1	·· 08.2	6 16.2	·· 57.4	258 48.3	27	·26 37.3	+ 67
16	202 16.0	35 16.0	39.7	82 26.2	36.2	188 47.7	08.1	21 18.4	57.3	273 10.0	28	26 30.6	+ 70
17	217 18.4	50 18.8	40.1	97 26.9	35.9	203 50.2	08.1	36 20.6	57.2	287 31.8	28	26 23.6	+ 71
18	232 20.9	65 21.6	− 0 40.5	112 27.7	+21 35.6	218 52.8	+ 4 08.0	51 22.9	+ 1 57.1	301 53.6	30	−26 16.5	+ 74
19	247 23.4	80 24.4	40.9	127 28.4	35.3	233 55.3	08.0	66 25.1	57.0	316 15.6	30	26 09.1	+ 75
20	262 25.8	95 27.2	41.4	142 29.2	35.0	248 57.8	08.0	81 27.3	56.9	330 37.6	30	26 01.6	+ 78
21	277 28.3	110 30.0	·· 41.8	157 30.0	·· 34.7	264 00.4	·· 07.9	96 29.5	·· 56.7	344 59.6	32	·25 53.8	+ 79
22	292 30.8	125 32.8	42.2	172 30.7	34.4	279 02.9	07.9	111 31.8	56.6	359 21.8	33	25 45.9	+ 81
23	307 33.2	140 35.6	42.6	187 31.5	34.1	294 05.5	07.8	126 34.0	56.5	13 44.1	33	25 37.8	+ 82
0	322 35.7	155 38.4	− 0 43.0	202 32.2	+21 33.8	309 08.0	+ 4 07.8	141 36.2	+ 1 56.4	28 06.4	34	−25 29.6	+ 85
1	337 38.2	170 41.2	43.4	217 33.0	33.5	324 10.5	07.7	156 38.4	56.3	42 28.8	35	25 21.1	+ 87
2	352 40.6	185 44.0	43.9	232 33.7	33.2	339 13.1	07.7	171 40.7	56.2	56 51.3	36	25 12.4	+ 88
3	7 43.1	200 46.9	·· 44.3	247 34.5	·· 32.9	354 15.6	·· 07.6	186 42.9	·· 56.1	71 13.9	38	·25 03.6	+ 90
4	22 45.5	215 49.7	44.7	262 35.2	32.6	9 18.2	07.6	201 45.1	56.0	85 36.7	38	24 54.6	+ 92
5	37 48.0	230 52.5	45.1	277 36.0	32.3	24 20.7	07.6	216 47.3	55.9	99 59.5	38	24 45.4	+ 93
6	52 50.5	245 55.4	− 0 45.5	292 36.8	+21 32.0	39 23.2	+ 4 07.5	231 49.6	+ 1 55.8	114 22.3	40	−24 36.1	+ 96
7	67 52.9	260 58.2	45.9	307 37.5	31.6	54 25.8	07.5	246 51.8	55.7	128 45.3	41	24 26.5	+ 97
8	82 55.4	276 01.0	46.3	322 38.3	31.3	69 28.3	07.4	261 54.0	55.5	143 08.4	42	24 16.8	+ 98
9	97 57.9	291 03.9	·· 46.7	337 39.0	·· 31.0	84 30.9	·· 07.4	276 56.2	·· 55.4	157 31.6	43	·24 07.0	+100
10	113 00.3	306 06.7	47.1	352 39.8	30.7	99 33.4	07.3	291 58.5	55.3	171 54.9	44	23 57.0	+102
11	128 02.8	321 09.6	47.5	7 40.5	30.4	114 36.0	07.3	307 00.7	55.2	186 18.3	45	23 46.8	+104
12	143 05.3	336 12.5	− 0 47.9	22 41.3	+21 30.1	129 38.5	+ 4 07.2	322 02.9	+ 1 55.1	200 41.8	46	−23 36.4	+105
13	158 07.7	351 15.3	48.3	37 42.1	29.8	144 41.1	07.2	337 05.1	55.0	215 05.4	48	23 25.9	+107
14	173 10.2	6 18.2	48.6	52 42.8	29.5	159 43.6	07.1	352 07.4	54.9	229 29.2	48	23 15.2	+108
15	188 12.7	21 21.1	·· 49.0	67 43.6	·· 29.2	174 46.1	·· 07.1	7 09.6	·· 54.8	243 53.0	49	·23 04.4	+110
16	203 15.1	36 23.9	49.4	82 44.3	28.9	189 48.7	07.1	22 11.8	54.7	258 16.9	51	22 53.4	+112
17	218 17.6	51 26.8	49.8	97 45.1	28.6	204 51.2	07.0	37 14.0	54.6	272 41.0	51	22 42.2	+113
18	233 20.0	66 29.7	− 0 50.2	112 45.9	+21 28.3	219 53.8	+ 4 07.0	52 16.2	+ 1 54.5	287 05.1	53	−22 30.9	+114
19	248 22.5	81 32.6	50.6	127 46.6	28.0	234 56.3	06.9	67 18.5	54.3	301 29.4	53	22 19.5	+116
20	263 25.0	96 35.5	50.9	142 47.4	27.6	249 58.9	06.9	82 20.7	54.2	315 53.7	55	22 07.9	+118
21	278 27.4	111 38.4	·· 51.3	157 48.1	·· 27.3	265 01.4	·· 06.8	97 22.9	·· 54.1	330 18.2	56	·21 56.1	+118
22	293 29.9	126 41.3	51.7	172 48.9	27.0	280 04.0	06.8	112 25.1	54.0	344 42.8	58	21 44.3	+121
23	308 32.4	141 44.2	52.1	187 49.6	26.7	295 06.5	06.7	127 27.4	53.9	359 07.6	58	21 32.2	+121
0	323 34.8	156 47.1	− 0 52.4	202 50.4	+21 26.4	310 09.1	+ 4 06.7	142 29.6	+ 1 53.8	13 32.4	59	−21 20.1	+123
1	338 37.3	171 50.0	52.8	217 51.2	26.1	325 11.6	06.6	157 31.8	53.7	27 57.3	61	21 07.8	+124
2	353 39.8	186 52.9	53.2	232 51.9	25.8	340 14.2	06.6	172 34.0	53.6	42 22.4	62	20 55.4	+126
3	8 42.2	201 55.8	·· 53.5	247 52.7	·· 25.5	355 16.7	·· 06.5	187 36.2	·· 53.5	56 47.6	63	·20 42.8	+127
4	23 44.7	216 58.7	53.9	262 53.5	25.2	10 19.3	06.5	202 38.5	53.4	71 12.9	64	20 30.1	+128
5	38 47.2	232 01.6	54.3	277 54.2	24.9	25 21.8	06.4	217 40.7	53.3	85 38.3	65	20 17.3	+129
6	53 49.6	247 04.6	− 0 54.6	292 55.0	+21 24.5	40 24.4	+ 4 06.4	232 42.9	+ 1 53.1	100 03.8	66	−20 04.4	+131
7	68 52.1	262 07.5	55.0	307 55.7	24.2	55 26.9	06.3	247 45.1	53.0	114 29.4	68	19 51.3	+132
8	83 54.5	277 10.4	55.3	322 56.5	23.9	70 29.5	06.3	262 47.4	52.9	128 55.2	68	19 38.1	+133
9	98 57.0	292 13.4	·· 55.7	337 57.3	·· 23.6	85 32.0	·· 06.2	277 49.6	·· 52.8	143 21.0	70	·19 24.8	+134
10	113 59.5	307 16.3	56.1	352 58.0	23.3	100 34.6	06.2	292 51.8	52.7	157 47.0	71	19 11.4	+136
11	129 01.9	322 19.2	56.4	7 58.8	23.0	115 37.1	06.1	307 54.0	52.6	172 13.1	72	18 57.8	+136
12	144 04.4	337 22.2	− 0 56.8	22 59.5	+21 22.7	130 39.7	+ 4 06.1	322 56.2	+ 1 52.5	186 39.3	73	−18 44.2	+138
13	159 06.9	352 25.1	57.1	38 00.3	22.4	145 42.2	06.0	337 58.5	52.4	201 05.6	75	18 30.4	+138
14	174 09.3	7 28.1	57.5	53 01.1	22.0	160 44.8	06.0	353 00.7	52.3	215 32.1	75	18 16.6	+140
15	189 11.8	22 31.1	·· 57.8	68 01.8	·· 21.7	175 47.3	·· 06.0	8 02.9	·· 52.2	229 58.6	77	·18 02.6	+141
16	204 14.3	37 34.0	58.1	83 02.6	21.4	190 49.9	05.9	23 05.1	52.0	244 25.3	77	17 48.5	+142
17	219 16.7	52 37.0	58.5	98 03.4	21.1	205 52.4	05.9	38 07.4	51.9	258 52.0	79	17 34.3	+142
18	234 19.2	67 40.0	− 0 58.8	113 04.1	+21 20.8	220 55.0	+ 4 05.8	53 09.6	+ 1 51.8	273 18.9	80	−17 20.1	+144
19	249 21.6	82 42.9	59.2	128 04.9	20.5	235 57.5	05.8	68 11.8	51.7	287 45.9	81	17 05.7	+145
20	264 24.1	97 45.9	59.5	143 05.7	20.1	251 00.1	05.7	83 14.0	51.6	302 13.0	83	16 51.2	+145
21	279 26.6	112 48.9	· 0 59.8	158 06.4	·· 19.8	266 02.7	·· 05.7	98 16.2	·· 51.5	316 40.3	83	·16 36.7	+147
22	294 29.0	127 51.9	1 00.2	173 07.2	19.5	281 05.2	05.6	113 18.5	51.4	331 07.6	84	16 22.0	+147
23	309 31.5	142 54.9	00.5	188 07.9	19.2	296 07.8	05.6	128 20.7	51.3	345 35.0	86	16 07.3	+148
24	324 34.0	157 57.9	− 1 00.8	203 08.7	+21 18.9	311 10.3	+ 4 05.5	143 22.9	+ 1 51.2	0 02.6	86	−15 52.5	+149
code	—	+ 28	− 4	+ 8	− 3	+ 26	0	+ 22	− 1				

GCT	SUN GHA	SUN Dec.
h	° ′	° ′
0	178 47.8	+14 41.4
1	193 47.9	40.6
2	208 48.0	39.9
3	223 48.1	•• 39.1
4	238 48.2	38.3
5	253 48.3	37.6
6	268 48.5	+14 36.8
7	283 48.6	36.0
8	298 48.7	35.3
9	313 48.8	•• 34.5
10	328 48.9	33.8
11	343 49.0	33.0
12	358 49.1	+14 32.2
13	13 49.2	31.5
14	28 49.4	30.7
15	43 49.5	•• 29.9
16	58 49.6	29.2
17	73 49.7	28.4
18	88 49.8	+14 27.6
19	103 49.9	26.9
20	118 50.1	26.1
21	133 50.2	•• 25.3
22	148 50.3	24.5
23	163 50.4	23.8
0	178 50.5	+14 23.0
1	193 50.6	22.2
2	208 50.8	21.5
3	223 50.9	•• 20.7
4	238 51.0	19.9
5	253 51.1	19.1
6	268 51.2	+14 18.4
7	283 51.3	17.6
8	298 51.5	16.8
9	313 51.6	•• 16.1
10	328 51.7	15.3
11	343 51.8	14.5
12	358 51.9	+14 13.7
13	13 52.1	13.0
14	28 52.2	12.2
15	43 52.3	•• 11.4
16	58 52.4	10.6
17	73 52.5	09.9
18	88 52.7	+14 09.1
19	103 52.8	08.3
20	118 52.9	07.5
21	133 53.0	•• 06.7
22	148 53.1	06.0
23	163 53.3	05.2
0	178 53.4	+14 04.4
1	193 53.5	03.6
2	208 53.6	02.8
3	223 53.8	•• 02.1
4	238 53.9	01.3
5	253 54.0	14 00.5
6	268 54.1	+13 59.7
7	283 54.3	58.9
8	298 54.4	58.2
9	313 54.5	•• 57.4
10	328 54.6	56.6
11	343 54.8	55.8
12	358 54.9	+13 55.0
13	13 55.0	54.2
14	28 55.1	53.5
15	43 55.3	•• 52.7
16	58 55.4	51.9
17	73 55.5	51.1
18	88 55.6	+13 50.3
19	103 55.8	49.5
20	118 55.9	48.7
21	133 56.0	•• 47.9
22	148 56.1	47.2
23	163 56.3	46.4
24	178 56.4	+13 45.6
code	—	− 7

No.	STARS SHA	Dec.	Transit Mer. Gr.
	° ′	° ′	h m
1	358 31.5	+28 49.4	2 35
2	358 20.9	+58 52.9	2 36
3	349 42.2	−18 14.9	3 10
4	339 20.3	+59 59.0	3 52
5	336 00.7	−57 28.5	4 05
6	332 31.0	+89 02.0	4 19
7	328 53.2	+23 14.2	4 33
8	315 53.4	−40 29.4	5 25
9	309 47.1	+49 41.4	5 50
10	291 42.9	+16 25.0	7 02
11	281 56.9	− 8 15.1	7 41
12	281 43.4	+45 57.1	7 41
13	279 22.1	+ 6 18.7	7 51
14	279 11.6	+28 34.2	7 52
15	276 33.7	− 1 13.6	8 02
16	271 51.8	+ 7 24.2	8 21
17	264 17.2	−52 39.7	8 51
18	259 14.9	−16 38.6	9 11
19	255 49.4	−28 54.0	9 25
20	245 48.6	+ 5 21.2	10 05
21	244 24.8	+28 08.8	10 10
22	234 37.9	−59 21.0	10 49
23	223 27.3	−43 14.0	11 34
24	221 51.0	−69 30.9	11 40
25	218 42.1	− 8 26.7	11 53
26	208 33.2	+12 12.4	12 33
27	194 48.9	+62 00.9	13 28
28	183 21.2	+14 50.7	14 14
29	174 02.2	−62 50.1	14 51
30	172 53.5	−56 50.7	14 56
31	168 47.3	−59 25.7	15 12
32	167 01.5	+56 13.5	15 19
33	159 30.3	+55 10.9	15 49
34	159 20.5	−10 54.6	15 50
35	153 35.4	+49 33.4	16 13
36	149 02.7	−36 08.2	16 31
37	146 38.2	+19 26.1	16 40
38	140 55.8	−60 38.6	17 03
39	137 17.4	+74 21.4	17 18
40	126 50.3	+26 52.7	17 59
41	120 37.8	−22 29.3	18 24
42	113 23.3	−26 19.8	18 53
43	109 06.8	−68 56.9	19 10
44	103 05.7	−15 40.1	19 34
45	97 24.9	−37 04.5	19 57
46	96 49.4	+12 35.6	19 59
47	91 07.4	+51 29.8	20 22
48	84 45.2	−34 24.8	20 47
49	81 10.2	+38 44.3	21 01
50	76 55.6	−26 21.6	21 18
51	62 53.3	+ 8 44.4	22 14
52	54 31.6	−56 53.6	22 48
53	50 02.9	+45 06.4	23 06
54	34 32.5	+ 9 39.2	0 11
55	28 41.4	−47 11.7	0 35
56	16 14.7	−29 52.6	1 24
57	14 24.4	+14 56.8	1 32

Lat.	Sunrise	Twlt. begins	Moonrise 14	15	16	17
N °	h m	h m	h m	h m	h m	h m
70	2 52	////	■	■	21 35	20 47
68	3 16	////	■	22 29	21 06	20 34
66	3 34	////	■	21 21	20 44	20 23
64	3 49	////	21 48	20 45	20 27	20 14
62	4 02	////	20 28	20 18	20 12	20 06
60	4 12	////	19 51	19 58	19 59	19 59
58	4 21	////	19 25	19 41	19 49	19 53
56	4 29	1 16	19 04	19 26	19 39	19 48
54	4 36	1 50	18 47	19 13	19 31	19 43
52	4 43	2 13	18 32	19 02	19 23	19 39
50	4 48	2 31	18 19	18 52	19 16	19 34
45	5 01	3 03	17 52	18 32	19 02	19 26
40	5 11	3 28	17 30	18 14	18 50	19 18
35	5 19	3 46	17 13	18 00	18 39	19 12
30	5 27	4 00	16 57	17 48	18 30	19 06
20	5 40	4 21	16 31	17 26	18 14	18 56
10	5 51	4 38	16 09	17 07	18 00	18 48
0	6 01	4 50	15 48	16 50	17 47	18 40
10	6 11	5 00	15 26	16 32	17 34	18 31
20	6 22	5 08	15 04	16 13	17 20	18 23
30	6 34	5 14	14 37	15 51	17 03	18 13
35	6 41	5 16	14 22	15 38	16 54	18 07
40	6 49	5 19	14 04	15 23	16 43	18 00
45	6 58	5 21	13 42	15 05	16 30	17 52
50	7 09	5 21	13 14	14 43	16 14	17 43
52	7 14	5 21	13 00	14 32	16 07	17 39
54	7 20	5 22	12 44	14 20	15 59	17 34
56	7 26	5 22	12 25	14 06	15 49	17 28
58	7 33	5 22	12 02	13 49	15 39	17 22
60	7 41	5 21	11 32	13 30	15 26	17 16
S						

Lat.	Sunset	Twlt. ends	Moonset 14	15	16	17
N °	h m	h m	h m	h m	h m	h m
70	21 13	////	■	■	■	2 50
68	20 50	////	■	23 56	27 18	3 18
66	20 32	////	■	25 04	1 04	3 38
64	20 18	////	22 28	25 40	1 40	3 54
62	20 06	////	23 48	26 05	2 05	4 07
60	19 55	////	24 24	0 24	2 25	4 19
58	19 46	////	24 50	0 50	2 41	4 28
56	19 39	22 46	25 10	1 10	2 55	4 37
54	19 32	22 15	25 27	1 27	3 06	4 44
52	19 25	21 52	0 14	1 42	3 17	4 51
50	19 20	21 35	0 29	1 54	3 26	4 57
45	19 08	21 03	1 00	2 20	3 45	5 10
40	18 58	20 40	1 23	2 41	4 01	5 20
35	18 49	20 22	1 43	2 58	4 14	5 29
30	18 42	20 08	1 59	3 12	4 26	5 37
20	18 29	19 46	2 27	3 37	4 45	5 50
10	18 18	19 31	2 51	3 58	5 02	6 02
0	18 08	19 19	3 14	4 18	5 17	6 12
10	17 58	19 10	3 36	4 37	5 33	6 23
20	17 47	19 02	4 00	4 58	5 49	6 34
30	17 35	18 56	4 27	5 22	6 08	6 47
35	17 28	18 53	4 43	5 36	6 19	6 54
40	17 21	18 52	5 02	5 52	6 31	7 03
45	17 12	18 51	5 25	6 11	6 45	7 12
50	17 01	18 51	5 53	6 34	7 03	7 24
52	16 56	18 51	6 07	6 45	7 11	7 29
54	16 50	18 50	6 23	6 58	7 20	7 35
56	16 44	18 51	6 43	7 13	7 30	7 41
58	16 37	18 51	7 06	7 30	7 42	7 49
60	16 29	18 52	7 37	7 51	7 55	7 57
S						

GCT	Equation of Time (App.—Mean) 14	15	16
h	m s	m s	m s
0	− 4 49.1	− 4 38.2	− 4 26.7
6	− 4 46.4	− 4 35.3	− 4 23.7
12	− 4 43.7	− 4 32.5	− 4 20.7
18	− 4 40.9	− 4 29.6	− 4 17.7
24	− 4 38.2	− 4 26.7	− 4 14.7

GCT of Transit Meridian of Greenwich

DAY	Moon	Venus	Mars	Jupiter	Saturn
	h m	h m	h m	h m	h m
14	22 03	13 39	10 31	3 27	14 35
15	23 04	13 35	10 29	3 23	14 31
16	24 00	13 30	10 28	3 19	14 28
17	24 51	13 25	10 27	3 15	14 24

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb	Venus	Mars
°	′	′	′
0			
	0.1	0.4	0.1
30			
	0.1	0.3	0.0
45			
	0.1	0.3	0.0
60			
	0.1	0.2	0.0
75			
	0.1	0.1	0.0
90			

Moon's Lower Limb *Add*

Alt.	14	15	16
°	′	′	′
0			
	20.0	20.1	19.7
4			
	20.0	20.1	19.7
8			
	20.0	20.1	19.7
12			
	19.9	20.0	19.7
16			
	19.8	20.0	19.6
20			
	19.8	19.9	19.5
24			
	19.6	19.8	19.4
28			
	19.5	19.7	19.3
32			
	19.4	19.5	19.2
36			
	19.3	19.4	19.1
40			
	19.1	19.2	18.9
44			
	18.9	19.0	18.7
48			
	18.8	18.8	18.6
52			
	18.6	18.6	18.4
56			
	18.4	18.4	18.2
60			
	18.1	18.2	18.0
64			
	17.9	18.0	17.8
68			
	17.7	17.8	17.6
72			
	17.5	17.5	17.4
76			
	17.2	17.3	17.1
80			
	17.0	17.0	16.9
84			
	16.7	16.8	16.7
88			
	16.6	16.6	16.5
90			

Add to table, back cover

Moon's Upper Limb *Subtract*

Alt.	14	15	16
°	′	′	′
0			
	13.0	12.9	13.2
4			
	13.0	13.0	13.2
8			
	13.1	13.0	13.2
12			
	13.1	13.0	13.2
16			
	13.2	13.1	13.3
20			
	13.3	13.2	13.4
24			
	13.4	13.3	13.5
28			
	13.5	13.4	13.6
32			
	13.6	13.5	13.7
36			
	13.7	13.7	13.8
40			
	13.9	13.9	14.0
44			
	14.1	14.0	14.2
48			
	14.3	14.2	14.3
52			
	14.4	14.4	14.5
56			
	14.6	14.6	14.7
60			
	14.9	14.8	14.9
64			
	15.1	15.1	15.1
68			
	15.3	15.3	15.3
72			
	15.5	15.5	15.5
76			
	15.8	15.8	15.8
80			
	16.0	16.0	16.0
84			
	16.3	16.3	16.2
88			
	16.4	16.5	16.4
90			

Subtract from table, back cover

GCT	♈	VENUS −3.9		MARS 1.9		JUPITER −2.3		SATURN 1.3		MOON			
	GHA	GHA	Dec.	GHA	Dec.	GHA	Dec.	GHA	Dec.	GHA	code	Dec.	code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
0	324 34.0	157 57.9	− 1 00.8	203 08.7	+21 18.9	311 10.3	+ 4 05.5	143 22.9	+ 1 51.2	0 02.6	86	−15 52.5	+149
1	339 36.4	173 00.9	01.1	218 09.5	18.6	326 12.9	05.5	158 25.1	51.1	14 30.2	88	15 37.6	+150
2	354 38.9	188 03.9	01.5	233 10.2	18.2	341 15.4	05.4	173 27.3	50.9	28 58.0	89	15 22.6	+151
3	9 41.4	203 06.9	·· 01.8	248 11.0	·· 17.9	356 18.0	·· 05.4	188 29.6	·· 50.8	43 25.9	90	·15 07.5	+151
4	24 43.8	218 09.9	02.1	263 11.8	17.6	11 20.6	05.3	203 31.8	50.7	57 53.9	90	14 52.4	+153
5	39 46.3	233 12.9	02.4	278 12.5	17.3	26 23.1	05.3	218 34.0	50.6	72 21.9	92	14 37.1	+152
6	54 48.8	248 15.9	− 1 02.7	293 13.3	+21 17.0	41 25.7	+ 4 05.2	233 36.2	+ 1 50.5	86 50.1	93	−14 21.9	+154
7	69 51.2	263 18.9	03.1	308 14.1	16.7	56 28.2	05.1	248 38.4	50.4	101 18.4	94	14 06.5	+154
8	84 53.7	278 21.9	03.4	323 14.8	16.3	71 30.8	05.1	263 40.7	50.3	115 46.8	95	13 51.1	+155
9	99 56.1	293 25.0	·· 03.7	338 15.6	·· 16.0	86 33.3	·· 05.0	278 42.9	·· 50.2	130 15.3	96	·13 35.6	+156
10	114 58.6	308 28.0	04.0	353 16.4	15.7	101 35.9	05.0	293 45.1	50.1	144 43.9	97	13 20.0	+156
11	130 01.1	323 31.0	04.3	8 17.1	15.4	116 38.5	04.9	308 47.3	50.0	159 12.6	98	13 04.4	+157
12	145 03.5	338 34.1	− 1 04.6	23 17.9	+21 15.1	131 41.0	+ 4 04.9	323 49.5	+ 1 49.8	173 41.4	99	−12 48.7	+158
13	160 06.0	353 37.1	04.9	38 18.7	14.7	146 43.6	04.8	338 51.8	49.7	188 10.3	99	12 32.9	+158
14	175 08.5	8 40.1	05.2	53 19.4	14.4	161 46.1	04.8	353 54.0	49.6	202 39.2	101	12 17.1	+158
15	190 10.9	23 43.2	·· 05.5	68 20.2	·· 14.1	176 48.7	·· 04.7	8 56.2	·· 49.5	217 08.3	102	·12 01.3	+159
16	205 13.4	38 46.2	05.8	83 21.0	13.8	191 51.3	04.7	23 58.4	49.4	231 37.5	102	11 45.4	+160
17	220 15.9	53 49.3	06.1	98 21.7	13.5	206 53.8	04.6	39 00.6	49.3	246 06.7	104	11 29.4	+160
18	235 18.3	68 52.4	− 1 06.4	113 22.5	+21 13.1	221 56.4	+ 4 04.6	54 02.9	+ 1 49.2	260 36.1	105	−11 13.4	+160
19	250 20.8	83 55.4	06.7	128 23.3	12.8	236 58.9	04.5	69 05.1	49.1	275 05.6	105	10 57.4	+161
20	265 23.3	98 58.5	07.0	143 24.0	12.5	252 01.5	04.5	84 07.3	49.0	289 35.1	106	10 41.3	+162
21	280 25.7	114 01.6	·· 07.3	158 24.8	·· 12.2	267 04.1	·· 04.4	99 09.5	·· 48.9	304 04.7	107	·10 25.1	+162
22	295 28.2	129 04.6	07.5	173 25.6	11.8	282 06.6	04.4	114 11.7	48.7	318 34.4	108	10 08.9	+162
23	310 30.6	144 07.7	07.8	188 26.4	11.5	297 09.2	04.3	129 14.0	48.6	333 04.2	109	9 52.7	+162
0	325 33.1	159 10.8	− 1 08.1	203 27.1	+21 11.2	312 11.8	+ 4 04.3	144 16.2	+ 1 48.5	347 34.1	110	− 9 36.5	+163
1	340 35.6	174 13.9	08.4	218 27.9	10.9	327 14.3	04.2	159 18.4	48.4	2 04.1	110	9 20.2	+164
2	355 38.0	189 17.0	08.7	233 28.7	10.6	342 16.9	04.2	174 20.6	48.3	16 34.1	111	9 03.8	+163
3	10 40.5	204 20.1	·· 08.9	248 29.4	·· 10.2	357 19.4	·· 04.1	189 22.8	·· 48.2	31 04.2	113	· 8 47.5	+164
4	25 43.0	219 23.2	09.2	263 30.2	09.9	12 22.0	04.0	204 25.0	48.1	45 34.5	112	8 31.1	+164
5	40 45.4	234 26.3	09.5	278 31.0	09.6	27 24.6	04.0	219 27.3	48.0	60 04.7	114	8 14.7	+165
6	55 47.9	249 29.4	− 1 09.8	293 31.7	+21 09.3	42 27.1	+ 4 03.9	234 29.5	+ 1 47.9	74 35.1	115	− 7 58.2	+164
7	70 50.4	264 32.5	10.0	308 32.5	08.9	57 29.7	03.9	249 31.7	47.7	89 05.6	115	7 41.8	+165
8	85 52.8	279 35.6	10.3	323 33.3	08.6	72 32.3	03.8	264 33.9	47.6	103 36.1	116	7 25.3	+165
9	100 55.3	294 38.7	·· 10.6	338 34.0	·· 08.3	87 34.8	·· 03.8	279 36.1	·· 47.5	118 06.7	116	· 7 08.8	+165
10	115 57.8	309 41.8	10.8	353 34.8	08.0	102 37.4	03.7	294 38.4	47.4	132 37.3	118	6 52.3	+166
11	131 00.2	324 44.9	11.1	8 35.6	07.6	117 40.0	03.7	309 40.6	47.3	147 08.1	118	6 35.7	+166
12	146 02.7	339 48.0	− 1 11.4	23 36.4	+21 07.3	132 42.5	+ 4 03.6	324 42.8	+ 1 47.2	161 38.9	118	− 6 19.1	+165
13	161 05.1	354 51.2	11.6	38 37.1	07.0	147 45.1	03.6	339 45.0	47.1	176 09.7	120	6 02.6	+166
14	176 07.6	9 54.3	11.9	53 37.9	06.7	162 47.7	03.5	354 47.2	47.0	190 40.7	120	5 46.0	+166
15	191 10.1	24 57.4	·· 12.1	68 38.7	·· 06.3	177 50.2	·· 03.4	9 49.4	·· 46.9	205 11.7	121	· 5 29.4	+166
16	206 12.5	40 00.6	12.4	83 39.4	06.0	192 52.8	03.4	24 51.7	46.7	219 42.8	121	5 12.8	+166
17	221 15.0	55 03.7	12.6	98 40.2	05.7	207 55.4	03.3	39 53.9	46.6	234 13.9	122	4 56.2	+166
18	236 17.5	70 06.9	− 1 12.9	113 41.0	+21 05.3	222 57.9	+ 4 03.3	54 56.1	+ 1 46.5	248 45.1	122	− 4 39.6	+167
19	251 19.9	85 10.0	13.1	128 41.8	05.0	238 00.5	03.2	69 58.3	46.4	263 16.3	124	4 22.9	+166
20	266 22.4	100 13.2	13.4	143 42.5	04.7	253 03.1	03.2	85 00.5	46.3	277 47.7	123	4 06.3	+166
21	281 24.9	115 16.3	·· 13.6	158 43.3	·· 04.4	268 05.7	·· 03.1	100 02.8	·· 46.2	292 19.0	125	· 3 49.7	+166
22	296 27.3	130 19.5	13.8	173 44.1	04.0	283 08.2	03.1	115 05.0	46.1	306 50.5	124	3 33.1	+167
23	311 29.8	145 22.7	14.1	188 44.9	03.7	298 10.8	03.0	130 07.2	46.0	321 21.9	126	3 16.4	+166
0	326 32.2	160 25.8	− 1 14.3	203 45.6	+21 03.4	313 13.4	+ 4 02.9	145 09.4	+ 1 45.9	335 53.5	126	− 2 59.8	+166
1	341 34.7	175 29.0	14.5	218 46.4	03.0	328 15.9	02.9	160 11.6	45.7	350 25.1	126	2 43.2	+166
2	356 37.2	190 32.2	14.8	233 47.2	02.7	343 18.5	02.8	175 13.8	45.6	4 56.7	127	2 26.6	+166
3	11 39.6	205 35.4	·· 15.0	248 48.0	·· 02.4	358 21.1	·· 02.8	190 16.1	·· 45.5	19 28.4	128	· 2 10.0	+166
4	26 42.1	220 38.5	15.2	263 48.7	02.1	13 23.7	02.7	205 18.3	45.4	34 00.2	128	1 53.4	+165
5	41 44.6	235 41.7	15.5	278 49.5	01.7	28 26.2	02.7	220 20.5	45.3	48 32.0	128	1 36.9	+166
6	56 47.0	250 44.9	− 1 15.7	293 50.3	+21 01.4	43 28.8	+ 4 02.6	235 22.7	+ 1 45.2	63 03.8	129	− 1 20.3	+166
7	71 49.5	265 48.1	15.9	308 51.1	01.1	58 31.4	02.5	250 24.9	45.1	77 35.7	129	1 03.7	+165
8	86 52.0	280 51.3	16.1	323 51.8	00.7	73 33.9	02.5	265 27.1	45.0	92 07.6	130	0 47.2	+165
9	101 54.4	295 54.5	·· 16.3	338 52.6	·· 00.4	88 36.5	·· 02.4	280 29.4	·· 44.9	106 39.6	130	· 0 30.7	+165
10	116 56.9	310 57.7	16.6	353 53.4	21 00.1	103 39.1	02.4	295 31.6	44.7	121 11.6	130	− 0 14.2	+165
11	131 59.4	326 00.9	16.8	8 54.2	20 59.7	118 41.7	02.3	310 33.8	44.6	135 43.6	131	+ 0 02.3	+164
12	147 01.8	341 04.1	− 1 17.0	23 54.9	+20 59.4	133 44.2	+ 4 02.3	325 36.0	+ 1 44.5	150 15.7	131	+ 0 18.7	+165
13	162 04.3	356 07.3	17.2	38 55.7	59.1	148 46.8	02.2	340 38.2	44.4	164 47.8	132	0 35.2	+164
14	177 06.7	11 10.5	17.4	53 56.5	58.7	163 49.4	02.1	355 40.4	44.3	179 20.0	132	0 51.6	+164
15	192 09.2	26 13.8	·· 17.6	68 57.3	·· 58.4	178 52.0	·· 02.1	10 42.7	·· 44.2	193 52.2	132	· 1 08.0	+163
16	207 11.7	41 17.0	17.8	83 58.0	58.1	193 54.5	02.0	25 44.9	44.1	208 24.4	133	1 24.3	+164
17	222 14.1	56 20.2	18.0	98 58.8	57.7	208 57.1	02.0	40 47.1	44.0	222 56.7	133	1 40.7	+163
18	237 16.6	71 23.5	− 1 18.2	113 59.6	+20 57.4	223 59.7	+ 4 01.9	55 49.3	+ 1 43.9	237 29.0	133	+ 1 57.0	+162
19	252 19.1	86 26.7	18.4	129 00.4	57.1	239 02.3	01.8	70 51.5	43.7	252 01.3	134	2 13.2	+163
20	267 21.5	101 29.9	18.6	144 01.1	56.7	254 04.8	01.8	85 53.7	43.6	266 33.7	133	2 29.5	+162
21	282 24.0	116 33.2	·· 18.8	159 01.9	·· 56.4	269 07.4	·· 01.7	100 56.0	·· 43.5	281 06.0	134	· 2 45.7	+162
22	297 26.5	131 36.4	19.0	174 02.7	56.1	284 10.0	01.7	115 58.2	43.4	295 38.4	135	3 01.9	+161
23	312 28.9	146 39.7	19.2	189 03.5	55.7	299 12.6	01.6	131 00.4	43.3	310 10.9	134	3 18.0	+161
24	327 31.4	161 42.9	− 1 19.4	204 04.3	+20 55.4	314 15.2	+ 4 01.5	146 02.6	+ 1 43.2	324 43.3	135	+ 3 34.1	+161
code	—	+ 32	− 2	+ 7	− 3	+ 26	0	+ 22	− 1				

GCT	SUN GHA	SUN Dec.
h	° ′	° ′
0	178 56.4	+13 45.6
1	193 56.5	44.8
2	208 56.7	44.0
3	223 56.8 ··	43.2
4	238 56.9	42.4
5	253 57.0	41.6
6	268 57.2	+13 40.8
7	283 57.3	40.0
8	298 57.4	39.3
9	313 57.6 ··	38.5
10	328 57.7	37.7
11	343 57.8	36.9
12	358 58.0	+13 36.1
13	13 58.1	35.3
14	28 58.2	34.5
15	43 58.3 ··	33.7
16	58 58.5	32.9
17	73 58.6	32.1
18	88 58.7	+13 31.3
19	103 58.9	30.5
20	118 59.0	29.7
21	133 59.1 ··	28.9
22	148 59.3	28.1
23	163 59.4	27.3
0	178 59.5	+13 26.5
1	193 59.7	25.7
2	208 59.8	24.9
3	223 59.9 ··	24.1
4	239 00.1	23.3
5	254 00.2	22.5
6	269 00.3	+13 21.7
7	284 00.5	20.9
8	299 00.6	20.1
9	314 00.7 ··	19.3
10	329 00.9	18.5
11	344 01.0	17.7
12	359 01.2	+13 16.9
13	14 01.3	16.1
14	29 01.4	15.3
15	44 01.6 ··	14.5
16	59 01.7	13.7
17	74 01.8	12.9
18	89 02.0	+13 12.1
19	104 02.1	11.3
20	119 02.3	10.5
21	134 02.4 ··	09.7
22	149 02.5	08.9
23	164 02.7	08.1
0	179 02.8	+13 07.3
1	194 02.9	06.5
2	209 03.1	05.7
3	224 03.2 ··	04.9
4	239 03.4	04.1
5	254 03.5	03.2
6	269 03.6	+13 02.4
7	284 03.8	01.6
8	299 03.9	00.8
9	314 04.1	·13 00.0
10	329 04.2	12 59.2
11	344 04.3	58.4
12	359 04.5	+12 57.6
13	14 04.6	56.8
14	29 04.8	56.0
15	44 04.9 ··	55.1
16	59 05.0	54.3
17	74 05.2	53.5
18	89 05.3	+12 52.7
19	104 05.5	51.9
20	119 05.6	51.1
21	134 05.8 ··	50.3
22	149 05.9	49.4
23	164 06.0	48.6
24	179 06.2	+12 47.8
code	—	− 8

STARS No.	SHA	Dec.	Transit Mer. Gr.
	° ′	° ′	h m
1	358 31.5	+28 49.5	2 23
2	358 20.9	+58 52.9	2 24
3	349 42.2	−18 14.9	2 58
4	339 20.3	+59 59.0	3 40
5	336 00.7	−57 28.5	3 53
6	332 30.1	+89 02.0	4 07
7	328 53.2	+23 14.2	4 22
8	315 53.4	−40 29.4	5 13
9	309 47.1	+49 41.4	5 38
10	291 42.9	+16 25.0	6 50
11	281 56.9	− 8 15.1	7 29
12	281 43.4	+45 57.1	7 30
13	279 22.0	+ 6 18.7	7 39
14	279 11.6	+28 34.2	7 40
15	276 33.7	− 1 13.6	7 50
16	271 51.8	+ 7 24.2	8 09
17	264 17.2	−52 39.7	8 39
18	259 14.9	−16 38.6	8 59
19	255 49.4	−28 54.0	9 13
20	245 48.6	+ 5 21.2	9 53
21	244 24.8	+28 08.8	9 59
22	234 37.9	−59 21.0	10 38
23	223 27.3	−43 14.0	11 22
24	221 51.0	−69 30.9	11 29
25	218 42.1	− 8 26.7	11 41
26	208 33.2	+12 12.4	12 22
27	194 48.9	+62 00.9	13 16
28	183 21.2	+14 50.7	14 02
29	174 02.2	−62 50.1	14 39
30	172 53.5	−56 50.7	14 44
31	168 47.4	−59 25.7	15 00
32	167 01.5	+56 13.5	15 07
33	159 30.3	+55 10.8	15 37
34	159 20.5	−10 54.6	15 38
35	153 35.5	+49 33.4	16 01
36	149 02.7	−36 08.2	16 19
37	146 38.2	+19 26.1	16 29
38	140 55.8	−60 38.6	16 51
39	137 17.5	+74 21.4	17 06
40	126 50.3	+26 52.7	17 48
41	120 37.9	−22 29.3	18 12
42	113 23.3	−26 19.8	18 41
43	109 06.8	−68 56.9	18 58
44	103 05.7	−15 40.1	19 22
45	97 24.9	−37 04.5	19 45
46	96 49.4	+12 35.7	19 47
47	91 07.4	+51 29.8	20 10
48	84 45.2	−34 24.8	20 35
49	81 10.2	+38 44.3	20 50
50	76 55.6	−26 21.6	21 07
51	62 53.3	+ 8 44.4	22 03
52	54 31.6	−56 53.6	22 36
53	50 02.9	+45 06.5	22 54
54	34 32.5	+ 9 39.2	23 56
55	28 41.4	−47 11.7	0 23
56	16 14.7	−29 52.6	1 13
57	14 24.4	+14 56.8	1 20

Lat.	Sunrise	Twlt. begins	Moonrise 17	18	19	20
N °	h m	h m	h m	h m	h m	h m
70	3 08	////	20 47	20 16	19 48	19 20
68	3 29	////	20 34	20 11	19 51	19 30
66	3 45	////	20 23	20 07	19 53	19 38
64	3 59	////	20 14	20 04	19 55	19 45
62	4 10	////	20 06	20 01	19 56	19 51
60	4 19	////	19 59	19 59	19 58	19 57
58	4 28	0 47	19 53	19 56	19 59	20 02
56	4 35	1 34	19 48	19 54	20 00	20 06
54	4 42	2 02	19 43	19 52	20 01	20 10
52	4 48	2 22	19 39	19 51	20 02	20 13
50	4 53	2 38	19 34	19 49	20 03	20 16
45	5 04	3 09	19 26	19 46	20 05	20 23
40	5 14	3 32	19 18	19 43	20 06	20 29
35	5 22	3 49	19 12	19 41	20 08	20 34
30	5 29	4 02	19 06	19 39	20 09	20 39
20	5 41	4 23	18 56	19 35	20 11	20 46
10	5 51	4 39	18 48	19 32	20 13	20 53
0	6 01	4 50	18 40	19 28	20 15	21 00
10	6 10	5 00	18 31	19 25	20 17	21 07
20	6 20	5 07	18 23	19 22	20 19	21 14
30	6 31	5 11	18 13	19 18	20 21	21 22
35	6 38	5 14	18 07	19 16	20 22	21 27
40	6 45	5 16	18 00	19 14	20 24	21 32
45	6 54	5 16	17 52	19 11	20 26	21 39
50	7 04	5 17	17 43	19 07	20 28	21 46
52	7 09	5 17	17 39	19 06	20 29	21 50
54	7 14	5 16	17 34	19 04	20 30	21 54
56	7 20	5 16	17 28	19 02	20 31	21 58
58	7 26	5 16	17 22	19 00	20 33	22 03
60	7 33	5 14	17 16	18 58	20 34	22 09
S						

Lat.	Sunset	Twlt. ends	Moonset 17	18	19	20
N °	h m	h m	h m	h m	h m	h m
70	20 56	////	2 50	5 26	7 39	9 46
68	20 36	////	3 18	5 37	7 41	9 39
66	20 20	////	3 38	5 46	7 42	9 33
64	20 07	////	3 54	5 53	7 43	9 28
62	19 56	////	4 07	5 59	7 43	9 23
60	19 47	////	4 19	6 05	7 44	9 19
58	19 39	23 09	4 28	6 09	7 44	9 16
56	19 31	22 27	4 37	6 13	7 45	9 13
54	19 25	22 01	4 44	6 17	7 45	9 10
52	19 19	21 41	4 51	6 20	7 46	9 08
50	19 14	21 26	4 57	6 24	7 46	9 06
45	19 03	20 56	5 10	6 30	7 47	9 01
40	18 54	20 35	5 20	6 36	7 48	8 57
35	18 46	20 18	5 29	6 40	7 48	8 53
30	18 39	20 04	5 37	6 44	7 49	8 50
20	18 27	19 44	5 50	6 51	7 49	8 45
10	18 17	19 29	6 02	6 57	7 50	8 41
0	18 07	19 18	6 12	7 03	7 51	8 36
10	17 58	19 09	6 23	7 09	7 51	8 32
20	17 48	19 02	6 34	7 15	7 52	8 28
30	17 37	18 58	6 47	7 21	7 53	8 22
35	17 31	18 56	6 54	7 25	7 53	8 19
40	17 23	18 54	7 03	7 29	7 53	8 16
45	17 15	18 54	7 12	7 34	7 54	8 12
50	17 05	18 54	7 24	7 40	7 54	8 08
52	17 00	18 54	7 29	7 43	7 55	8 06
54	16 55	18 55	7 35	7 46	7 55	8 03
56	16 49	18 55	7 41	7 49	7 55	8 01
58	16 43	18 56	7 49	7 52	7 55	7 58
60	16 36	18 58	7 57	7 56	7 56	7 55
S						

GCT	Equation of Time (App.—Mean) 17	18	19
h	m s	m s	m s
0	− 4 14.7	− 4 02.1	− 3 49.1
6	− 4 11.6	− 3 58.9	− 3 45.7
12	− 4 08.5	− 3 55.7	− 3 42.4
18	− 4 05.3	− 3 52.4	− 3 39.0
24	− 4 02.1	− 3 49.1	− 3 35.5

GCT of Transit Meridian of Greenwich DAY	Moon	Venus	Mars	Jupiter	Saturn
	h m	h m	h m	h m	h m
17	24 51	13 25	10 27	3 15	14 24
18	0 51	13 21	10 26	3 11	14 21
19	1 40	13 16	10 24	3 07	14 17
20	2 26	13 10	10 23	3 03	14 14

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb	Venus	Mars
°	′	′	′
0			
	0.1	0.4	0.1
30			
	0.1	0.4	0.0
45			
	0.1	0.3	0.0
60			
	0.1	0.2	0.0
75			
	0.1	0.1	0.0
90			

Moon's Lower Limb
Add

Alt.	17	18	19
°	′	′	′
0			
	19.2	18.3	17.3
4			
	19.2	18.3	17.3
8			
	19.2	18.3	17.3
12			
	19.2	18.3	17.3
16			
	19.1	18.2	17.3
20			
	19.0	18.2	17.2
24			
	18.9	18.1	17.2
28			
	18.9	18.1	17.1
32			
	18.7	18.0	17.1
36			
	18.6	17.9	17.0
40			
	18.5	17.8	17.0
44			
	18.4	17.7	16.9
48			
	18.2	17.6	16.8
52			
	18.0	17.4	16.8
56			
	17.9	17.3	16.7
60			
	17.7	17.2	16.6
64			
	17.5	17.0	16.5
68			
	17.3	16.9	16.4
72			
	17.1	16.8	16.3
76			
	16.9	16.6	16.2
80			
	16.7	16.5	16.1
84			
	16.5	16.3	16.0
88			
	16.4	16.2	16.0
90			

Add to table, back cover

Moon's Upper Limb
Subtract

Alt.	17	18	19
°	′	′	′
0			
	13.4	14.0	14.5
4			
	13.5	14.0	14.5
8			
	13.5	14.0	14.6
12			
	13.5	14.0	14.6
16			
	13.6	14.1	14.6
20			
	13.7	14.1	14.6
24			
	13.7	14.2	14.7
28			
	13.8	14.2	14.7
32			
	13.9	14.3	14.8
36			
	14.1	14.4	14.8
40			
	14.2	14.5	14.9
44			
	14.3	14.6	15.0
48			
	14.5	14.7	15.0
52			
	14.6	14.9	15.1
56			
	14.8	15.0	15.2
60			
	15.0	15.1	15.3
64			
	15.2	15.3	15.4
68			
	15.3	15.4	15.5
72			
	15.5	15.5	15.5
76			
	15.7	15.7	15.6
80			
	15.9	15.8	15.7
84			
	16.1	16.0	15.8
88			
	16.3	16.1	15.9
90			

Subtract from table, back cover

Full Moon 17

GCT	♈	VENUS −3.8		MARS 1.9		JUPITER −2.3		SATURN 1.3		MOON			
	GHA	GHA	Dec.	GHA	Dec.	GHA	Dec.	GHA	Dec.	GHA	code	Dec.	code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
0	327 31.4	161 42.9	− 1 19.4	204 04.3	+20 55.4	314 15.2	+ 4 01.5	146 02.6	+ 1 43.2	324 43.3	135	+ 3 34.1	+161
1	342 33.8	176 46.2	19.5	219 05.0	55.1	329 17.7	01.5	161 04.8	43.1	339 15.8	135	3 50.2	+160
2	357 36.3	191 49.4	19.7	234 05.8	54.7	344 20.3	01.4	176 07.0	43.0	353 48.3	135	4 06.2	+160
3	12 38.8	206 52.7	·· 19.9	249 06.6	·· 54.4	359 22.9	·· 01.4	191 09.2	·· 42.8	8 20.8	136	· 4 22.2	+159
4	27 41.2	221 56.0	20.1	264 07.4	54.1	14 25.5	01.3	206 11.5	42.7	22 53.4	135	4 38.1	+159
5	42 43.7	236 59.2	20.3	279 08.1	53.7	29 28.0	01.3	221 13.7	42.6	37 25.9	136	4 54.0	+159
6	57 46.2	252 02.5	− 1 20.4	294 08.9	+20 53.4	44 30.6	+ 4 01.2	236 15.9	+ 1 42.5	51 58.5	136	+ 5 09.9	+158
7	72 48.6	267 05.8	20.6	309 09.7	53.0	59 33.2	01.1	251 18.1	42.4	66 31.1	136	5 25.7	+158
8	87 51.1	282 09.1	20.8	324 10.5	52.7	74 35.8	01.1	266 20.3	42.3	81 03.7	136	5 41.5	+157
9	102 53.6	297 12.4	·· 21.0	339 11.3	·· 52.4	89 38.4	·· 01.0	281 22.5	·· 42.2	95 36.3	136	· 5 57.2	+157
10	117 56.0	312 15.6	21.1	354 12.0	52.0	104 40.9	00.9	296 24.7	42.1	110 08.9	136	6 12.9	+156
11	132 58.5	327 18.9	21.3	9 12.8	51.7	119 43.5	00.9	311 27.0	42.0	124 41.5	137	6 28.5	+156
12	148 01.0	342 22.2	− 1 21.5	24 13.6	+20 51.4	134 46.1	+ 4 00.8	326 29.2	+ 1 41.8	139 14.2	136	+ 6 44.1	+155
13	163 03.4	357 25.5	21.6	39 14.4	51.0	149 48.7	00.8	341 31.4	41.7	153 46.8	137	6 59.6	+155
14	178 05.9	12 28.8	21.8	54 15.2	50.7	164 51.3	00.7	356 33.6	41.6	168 19.5	137	7 15.1	+154
15	193 08.3	27 32.1	·· 21.9	69 15.9	·· 50.3	179 53.9	·· 00.6	11 35.8	·· 41.5	182 52.2	136	· 7 30.5	+153
16	208 10.8	42 35.4	22.1	84 16.7	50.0	194 56.4	00.6	26 38.0	41.4	197 24.8	137	7 45.8	+154
17	223 13.3	57 38.7	22.2	99 17.5	49.7	209 59.0	00.5	41 40.3	41.3	211 57.5	137	8 01.2	+152
18	238 15.7	72 42.1	− 1 22.4	114 18.3	+20 49.3	225 01.6	+ 4 00.5	56 42.5	+ 1 41.2	226 30.2	137	+ 8 16.4	+152
19	253 18.2	87 45.4	22.5	129 19.1	49.0	240 04.2	00.4	71 44.7	41.1	241 02.9	136	8 31.6	+152
20	268 20.7	102 48.7	22.7	144 19.9	48.6	255 06.8	00.3	86 46.9	40.9	255 35.5	137	8 46.8	+150
21	283 23.1	117 52.0	·· 22.8	159 20.6	·· 48.3	270 09.4	·· 00.3	101 49.1	·· 40.8	270 08.2	137	· 9 01.8	+151
22	298 25.6	132 55.3	23.0	174 21.4	48.0	285 11.9	00.2	116 51.3	40.7	284 40.9	137	9 16.9	+149
23	313 28.1	147 58.7	23.1	189 22.2	47.6	300 14.5	00.1	131 53.5	40.6	299 13.6	136	9 31.8	+149
0	328 30.5	163 02.0	− 1 23.3	204 23.0	+20 47.3	315 17.1	+ 4 00.1	146 55.8	+ 1 40.5	313 46.2	137	+ 9 46.7	+148
1	343 33.0	178 05.4	23.4	219 23.8	46.9	330 19.7	00.0	161 58.0	40.4	328 18.9	137	10 01.5	+148
2	358 35.5	193 08.7	23.5	234 24.5	46.6	345 22.3	4 00.0	177 00.2	40.3	342 51.6	136	10 16.3	+147
3	13 37.9	208 12.0	·· 23.7	249 25.3	·· 46.2	0 24.9	· 3 59.9	192 02.4	·· 40.2	357 24.2	137	·10 31.0	+147
4	28 40.4	223 15.4	23.8	264 26.1	45.9	15 27.5	59.8	207 04.6	40.0	11 56.9	136	10 45.7	+145
5	43 42.8	238 18.7	23.9	279 26.9	45.6	30 30.0	59.8	222 06.8	39.9	26 29.5	136	11 00.2	+145
6	58 45.3	253 22.1	− 1 24.0	294 27.7	+20 45.2	45 32.6	+ 3 59.7	237 09.0	+ 1 39.8	41 02.1	136	+11 14.7	+145
7	73 47.8	268 25.5	24.2	309 28.5	44.9	60 35.2	59.6	252 11.2	39.7	55 34.7	137	11 29.2	+143
8	88 50.2	283 28.8	24.3	324 29.2	44.5	75 37.8	59.6	267 13.5	39.6	70 07.4	135	11 43.5	+143
9	103 52.7	298 32.2	·· 24.4	339 30.0	·· 44.2	90 40.4	·· 59.5	282 15.7	·· 39.5	84 39.9	136	·11 57.8	+143
10	118 55.2	313 35.6	24.5	354 30.8	43.8	105 43.0	59.5	297 17.9	39.4	99 12.5	136	12 12.1	+141
11	133 57.6	328 38.9	24.6	9 31.6	43.5	120 45.6	59.4	312 20.1	39.3	113 45.1	135	12 26.2	+141
12	149 00.1	343 42.3	− 1 24.8	24 32.4	+20 43.2	135 48.2	+ 3 59.3	327 22.3	+ 1 39.1	128 17.6	136	+12 40.3	+140
13	164 02.6	358 45.7	24.9	39 33.2	42.8	150 50.7	59.3	342 24.5	39.0	142 50.2	135	12 54.3	+139
14	179 05.0	13 49.1	25.0	54 34.0	42.5	165 53.3	59.2	357 26.7	38.9	157 22.7	135	13 08.2	+139
15	194 07.5	28 52.5	·· 25.1	69 34.7	·· 42.1	180 55.9	·· 59.1	12 28.9	·· 38.8	171 55.2	135	·13 22.1	+138
16	209 09.9	43 55.8	25.2	84 35.5	41.8	195 58.5	59.1	27 31.2	38.7	186 27.7	134	13 35.9	+137
17	224 12.4	58 59.2	25.3	99 36.3	41.4	211 01.1	59.0	42 33.4	38.6	201 00.1	135	13 49.6	+136
18	239 14.9	74 02.6	− 1 25.4	114 37.1	+20 41.1	226 03.7	+ 3 58.9	57 35.6	+ 1 38.5	215 32.6	134	+14 03.2	+135
19	254 17.3	89 06.0	25.5	129 37.9	40.7	241 06.3	58.9	72 37.8	38.4	230 05.0	134	14 16.7	+135
20	269 19.8	104 09.4	25.6	144 38.7	40.4	256 08.9	58.8	87 40.0	38.2	244 37.4	134	14 30.2	+134
21	284 22.3	119 12.8	·· 25.7	159 39.5	·· 40.1	271 11.5	·· 58.8	102 42.2	·· 38.1	259 09.8	133	·14 43.6	+133
22	299 24.7	134 16.2	25.8	174 40.2	39.7	286 14.1	58.7	117 44.4	38.0	273 42.1	133	14 56.9	+132
23	314 27.2	149 19.7	25.9	189 41.0	39.4	301 16.7	58.6	132 46.7	37.9	288 14.4	134	15 10.1	+132
0	329 29.7	164 23.1	− 1 25.9	204 41.8	+20 39.0	316 19.2	+ 3 58.6	147 48.9	+ 1 37.8	302 46.8	132	+15 23.3	+130
1	344 32.1	179 26.5	26.0	219 42.6	38.7	331 21.8	58.5	162 51.1	37.7	317 19.0	133	15 36.3	+130
2	359 34.6	194 29.9	26.1	234 43.4	38.3	346 24.4	58.4	177 53.3	37.6	331 51.3	132	15 49.3	+129
3	14 37.1	209 33.3	·· 26.2	249 44.2	·· 38.0	1 27.0	·· 58.4	192 55.5	·· 37.4	346 23.5	132	·16 02.2	+128
4	29 39.5	224 36.8	26.3	264 45.0	37.6	16 29.6	58.3	207 57.7	37.3	0 55.7	132	16 15.0	+127
5	44 42.0	239 40.2	26.4	279 45.8	37.3	31 32.2	58.2	222 59.9	37.2	15 27.9	131	16 27.7	+126
6	59 44.4	254 43.6	− 1 26.4	294 46.5	+20 36.9	46 34.8	+ 3 58.2	238 02.1	+ 1 37.1	30 00.0	131	+16 40.3	+125
7	74 46.9	269 47.1	26.5	309 47.3	36.6	61 37.4	58.1	253 04.3	37.0	44 32.1	131	16 52.8	+125
8	89 49.4	284 50.5	26.6	324 48.1	36.2	76 40.0	58.0	268 06.6	36.9	59 04.2	130	17 05.3	+123
9	104 51.8	299 54.0	·· 26.6	339 48.9	·· 35.9	91 42.6	·· 58.0	283 08.8	·· 36.8	73 36.2	130	·17 17.6	+123
10	119 54.3	314 57.4	26.7	354 49.7	35.5	106 45.2	57.9	298 11.0	36.7	88 08.2	130	17 29.9	+122
11	134 56.8	330 00.8	26.8	9 50.5	35.2	121 47.8	57.8	313 13.2	36.5	102 40.2	129	17 42.1	+120
12	149 59.2	345 04.3	− 1 26.8	24 51.3	+20 34.8	136 50.4	+ 3 57.8	328 15.4	+ 1 36.4	117 12.1	129	+17 54.1	+120
13	165 01.7	0 07.8	26.9	39 52.1	34.5	151 53.0	57.7	343 17.6	36.3	131 44.0	129	18 06.1	+119
14	180 04.2	15 11.2	27.0	54 52.9	34.1	166 55.6	57.6	358 19.8	36.2	146 15.9	129	18 18.0	+118
15	195 06.6	30 14.7	·· 27.0	69 53.6	·· 33.8	181 58.2	·· 57.6	13 22.0	·· 36.1	160 47.8	128	·18 29.8	+117
16	210 09.1	45 18.1	27.1	84 54.4	33.4	197 00.8	57.5	28 24.2	36.0	175 19.6	127	18 41.5	+116
17	225 11.5	60 21.6	27.1	99 55.2	33.1	212 03.4	57.4	43 26.5	35.9	189 51.3	128	18 53.1	+115
18	240 14.0	75 25.1	− 1 27.2	114 56.0	+20 32.7	227 06.0	+ 3 57.4	58 28.7	+ 1 35.8	204 23.1	126	+19 04.6	+115
19	255 16.5	90 28.6	27.2	129 56.8	32.4	242 08.6	57.3	73 30.9	35.6	218 54.7	127	19 16.1	+113
20	270 18.9	105 32.0	27.3	144 57.6	32.0	257 11.2	57.2	88 33.1	35.5	233 26.4	126	19 27.4	+112
21	285 21.4	120 35.5	·· 27.3	159 58.4	·· 31.7	272 13.8	·· 57.2	103 35.3	·· 35.4	247 58.0	126	·19 38.6	+111
22	300 23.9	135 39.0	27.4	174 59.2	31.3	287 16.4	57.1	118 37.5	35.3	262 29.6	125	19 49.7	+110
23	315 26.3	150 42.5	27.4	190 00.0	31.0	302 19.0	57.0	133 39.7	35.2	277 01.1	125	20 00.7	+109
24	330 28.8	165 46.0	− 1 27.4	205 00.8	+20 30.6	317 21.6	+ 3 57.0	148 41.9	+ 1 35.1	291 32.6	125	+20 11.6	+108
code	—	+ 34	− 1	+ 8	− 4	+ 25	0	+ 22	− 1				

GCT h	SUN GHA ° ′	SUN Dec. ° ′
0	179 06.2	+12 47.8
1	194 06.3	47.0
2	209 06.5	46.2
3	224 06.6	•• 45.4
4	239 06.8	44.6
5	254 06.9	43.7
6	269 07.1	+12 42.9
7	284 07.2	42.1
8	299 07.3	41.3
9	314 07.5	•• 40.5
10	329 07.6	39.6
11	344 07.8	38.8
12	359 07.9	+12 38.0
13	14 08.1	37.2
14	29 08.2	36.4
15	44 08.4	•• 35.5
16	59 08.5	34.7
17	74 08.7	33.9
18	89 08.8	+12 33.1
19	104 09.0	32.3
20	119 09.1	31.4
21	134 09.2	•• 30.6
22	149 09.4	29.8
23	164 09.5	29.0
0	179 09.7	+12 28.1
1	194 09.8	27.3
2	209 10.0	26.5
3	224 10.1	•• 25.7
4	239 10.3	24.8
5	254 10.4	24.0
6	269 10.6	+12 23.2
7	284 10.7	22.4
8	299 10.9	21.5
9	314 11.0	•• 20.7
10	329 11.2	19.9
11	344 11.3	19.1
12	359 11.5	+12 18.2
13	14 11.6	17.4
14	29 11.8	16.6
15	44 11.9	•• 15.8
16	59 12.1	14.9
17	74 12.2	14.1
18	89 12.4	+12 13.3
19	104 12.6	12.4
20	119 12.7	11.6
21	134 12.9	•• 10.8
22	149 13.0	09.9
23	164 13.2	09.1
0	179 13.3	+12 08.3
1	194 13.5	07.4
2	209 13.6	06.6
3	224 13.8	•• 05.8
4	239 13.9	05.0
5	254 14.1	04.1
6	269 14.2	+12 03.3
7	284 14.4	02.4
8	299 14.5	01.6
9	314 14.7	·12 00.8
10	329 14.9	11 59.9
11	344 15.0	59.1
12	359 15.2	+11 58.3
13	14 15.3	57.4
14	29 15.5	56.6
15	44 15.6	•• 55.8
16	59 15.8	54.9
17	74 15.9	54.1
18	89 16.1	+11 53.3
19	104 16.3	52.4
20	119 16.4	51.6
21	134 16.6	•• 50.7
22	149 16.7	49.9
23	164 16.9	49.1
24	179 17.0	+11 48.2
code	—	− 8

STARS No.	SHA ° ′	Dec. ° ′	Transit Mer. Gr. h m
1	358 31.5	+28 49.5	2 12
2	358 20.9	+58 52.9	2 12
3	349 42.2	−18 14.9	2 47
4	339 20.3	+59 59.0	3 28
5	336 00.7	−57 28.5	3 41
6	332 29.2	+89 02.0	3 55
7	328 53.2	+23 14.2	4 10
8	315 53.4	−40 29.4	5 02
9	309 47.1	+49 41.4	5 26
10	291 42.8	+16 25.0	6 38
11	281 56.8	− 8 15.1	7 17
12	281 43.4	+45 57.1	7 18
13	279 22.0	+ 6 18.7	7 27
14	279 11.6	+28 34.2	7 28
15	276 33.7	− 1 13.6	7 38
16	271 51.8	+ 7 24.2	7 57
17	264 17.2	−52 39.7	8 27
18	259 14.9	−16 38.6	8 48
19	255 49.4	−28 54.0	9 01
20	245 48.6	+ 5 21.2	9 41
21	244 24.8	+28 08.8	9 47
22	234 37.9	−59 20.9	10 26
23	223 27.2	−43 14.0	11 10
24	221 51.0	−69 30.9	11 17
25	218 42.1	− 8 26.7	11 29
26	208 33.2	+12 12.4	12 10
27	194 48.9	+62 00.9	13 05
28	183 21.2	+14 50.7	13 50
29	174 02.3	−62 50.1	14 27
30	172 53.5	−56 50.7	14 32
31	168 47.4	−59 25.7	14 48
32	167 01.5	+56 13.5	14 55
33	159 30.3	+55 10.8	15 25
34	159 20.5	−10 54.6	15 26
35	153 35.5	+49 33.4	15 49
36	149 02.7	−36 08.2	16 07
37	146 38.2	+19 26.1	16 17
38	140 55.8	−60 38.6	16 40
39	137 17.6	+74 21.4	16 54
40	126 50.3	+26 52.7	17 36
41	120 37.9	−22 29.3	18 00
42	113 23.3	−26 19.8	18 29
43	109 06.8	−68 56.9	18 46
44	103 05.8	−15 40.1	19 10
45	97 24.9	−37 04.5	19 33
46	96 49.4	+12 35.7	19 35
47	91 07.5	+51 29.8	19 58
48	84 45.2	−34 24.8	20 24
49	81 10.2	+38 44.4	20 38
50	76 55.6	−26 21.6	20 55
51	62 53.3	+ 8 44.4	21 51
52	54 31.7	−56 53.6	22 24
53	50 02.9	+45 06.5	22 42
54	34 32.4	+ 9 39.2	23 44
55	28 41.3	−47 11.7	0 11
56	16 14.7	−29 52.6	1 01
57	14 24.4	+14 56.8	1 08

Lat.	Sunrise	Twlt. begins	Moonrise 20	21	22	23
N °	h m	h m	h m	h m	h m	h m
70	3 22	////	19 20	18 45	17 41	▭
68	3 41	////	19 30	19 05	18 28	▭
66	3 55	////	19 38	19 21	18 59	18 15
64	4 08	////	19 45	19 35	19 22	19 04
62	4 18	////	19 51	19 46	19 41	19 35
60	4 27	////	19 57	19 56	19 56	19 59
58	4 34	1 14	20 02	20 05	20 10	20 18
56	4 41	1 49	20 06	20 12	20 21	20 34
54	4 47	2 13	20 10	20 19	20 31	20 47
52	4 52	2 31	20 13	20 25	20 40	20 59
50	4 57	2 46	20 16	20 31	20 48	21 10
45	5 08	3 15	20 23	20 43	21 05	21 32
40	5 16	3 35	20 29	20 53	21 19	21 50
35	5 24	3 52	20 34	21 02	21 31	22 05
30	5 30	4 05	20 39	21 09	21 42	22 18
20	5 41	4 24	20 46	21 23	22 00	22 41
10	5 51	4 39	20 53	21 34	22 16	23 01
0	6 00	4 50	21 00	21 45	22 32	23 19
10	6 09	4 58	21 07	21 56	22 47	23 38
20	6 18	5 05	21 14	22 08	23 03	23 58
30	6 28	5 09	21 22	22 22	23 22	24 21
35	6 34	5 10	21 27	22 30	23 33	24 35
40	6 41	5 11	21 32	22 39	23 46	24 51
45	6 49	5 11	21 39	22 50	24 01	0 01
50	6 58	5 11	21 46	23 04	24 20	0 20
52	7 02	5 11	21 50	23 10	24 29	0 29
54	7 07	5 10	21 54	23 17	24 39	0 39
56	7 12	5 10	21 58	23 24	24 50	0 50
58	7 18	5 08	22 03	23 33	25 03	1 03
60	7 25	5 07	22 09	23 43	25 18	1 18
S						

Lat.	Sunset	Twlt. ends	Moonset 20	21	22	23
N °	h m	h m	h m	h m	h m	h m
70	20 41	////	9 46	11 58	14 38	▭
68	20 23	////	9 39	11 39	13 52	▭
66	20 09	////	9 33	11 24	13 22	15 44
64	19 57	////	9 28	11 12	13 00	14 57
62	19 47	////	9 23	11 02	12 43	14 26
60	19 38	////	9 19	10 53	12 28	14 04
58	19 31	22 44	9 16	10 46	12 16	13 45
56	19 24	22 11	9 13	10 39	12 05	13 30
54	19 18	21 49	9 10	10 33	11 56	13 17
52	19 13	21 31	9 08	10 28	11 47	13 06
50	19 08	21 17	9 06	10 23	11 40	12 55
45	18 58	20 49	9 01	10 13	11 24	12 34
40	18 49	20 28	8 57	10 05	11 11	12 17
35	18 42	20 13	8 53	9 57	11 00	12 03
30	18 36	20 01	8 50	9 51	10 51	11 51
20	18 25	19 41	8 45	9 40	10 35	11 29
10	18 15	19 27	8 41	9 30	10 20	11 11
0	18 07	19 17	8 36	9 22	10 07	10 54
10	17 58	19 09	8 32	9 13	9 54	10 37
20	17 49	19 03	8 28	9 03	9 40	10 19
30	17 39	18 59	8 22	8 53	9 24	9 59
35	17 33	18 58	8 19	8 46	9 15	9 47
40	17 26	18 57	8 16	8 39	9 04	9 33
45	17 19	18 58	8 12	8 31	8 52	9 17
50	17 09	18 58	8 08	8 22	8 37	8 57
52	17 05	18 58	8 06	8 17	8 30	8 47
54	17 00	18 59	8 03	8 12	8 23	8 37
56	16 55	19 00	8 01	8 07	8 14	8 25
58	16 50	19 02	7 58	8 01	8 05	8 11
60	16 43	19 04	7 55	7 54	7 54	7 55
S						

GCT h	Equation of Time (App.—Mean) 20 m s	21 m s	22 m s
0	− 3 35.5	− 3 21.5	− 3 07.1
6	− 3 32.1	− 3 18.0	− 3 03.4
12	− 3 28.6	− 3 14.3	− 2 59.6
18	− 3 25.1	− 3 10.7	− 2 55.9
24	− 3 21.5	− 3 07.1	− 2 52.1

GCT of Transit Meridian of Greenwich

DAY	Moon h m	Venus h m	Mars h m	Jupiter h m	Saturn h m
20	2 26	13 10	10 23	3 03	14 14
21	3 11	13 05	10 22	2 58	14 10
22	3 56	13 00	10 21	2 54	14 07
23	4 43	12 54	10 19	2 50	14 03

ADDITIONAL ALTITUDE CORRECTIONS

Alt. °	Sun's Low'r Limb ′	Venus ′	Mars ′
0			
	0.1	0.5	0.1
30			
	0.1	0.4	0.0
45			
	0.1	0.3	0.0
60			
	0.1	0.2	0.0
75			
	0.1	0.1	0.0
90			

Moon's Lower Limb
Add

Alt. °	20 ′	21 ′	22 ′
0			
	16.2	15.2	14.2
4			
	16.2	15.2	14.2
8			
	16.2	15.2	14.2
12			
	16.2	15.2	14.2
16			
	16.2	15.2	14.2
20			
	16.2	15.2	14.2
24			
	16.1	15.2	14.3
28			
	16.1	15.2	14.3
32			
	16.1	15.2	14.3
36			
	16.1	15.2	14.4
40			
	16.1	15.2	14.4
44			
	16.0	15.3	14.5
48			
	16.0	15.3	14.5
52			
	16.0	15.3	14.6
56			
	16.0	15.3	14.7
60			
	15.9	15.3	14.7
64			
	15.9	15.3	14.8
68			
	15.9	15.4	14.9
72			
	15.8	15.4	14.9
76			
	15.8	15.4	15.0
80			
	15.8	15.4	15.1
84			
	15.7	15.4	15.2
88			
	15.7	15.5	15.2
90			

Add to table, back cover

Moon's Upper Limb
Subtract

Alt. °	20 ′	21 ′	22 ′
0			
	15.2	15.8	16.4
4			
	15.2	15.8	16.3
8			
	15.2	15.8	16.3
12			
	15.2	15.8	16.3
16			
	15.2	15.8	16.3
20			
	15.2	15.7	16.3
24			
	15.2	15.7	16.2
28			
	15.3	15.7	16.2
32			
	15.3	15.7	16.2
36			
	15.3	15.7	16.1
40			
	15.3	15.7	16.1
44			
	15.3	15.7	16.0
48			
	15.4	15.7	16.0
52			
	15.4	15.6	15.9
56			
	15.4	15.6	15.8
60			
	15.5	15.6	15.8
64			
	15.5	15.6	15.7
68			
	15.5	15.6	15.6
72			
	15.5	15.6	15.6
76			
	15.6	15.5	15.5
80			
	15.6	15.5	15.4
84			
	15.7	15.5	15.3
88			
	15.7	15.5	15.3
90			

Subtract from table, back cover

GCT	♈ GHA	VENUS −3.6 GHA	Dec.	MARS 1.9 GHA	Dec.	JUPITER −2.4 GHA	Dec.	SATURN 1.2 GHA	Dec.	MOON GHA	code	Dec.	code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
0	330 28.8	165 46.0	− 1 27.4	205 00.8	+20 30.6	317 21.6	+ 3 57.0	148 41.9	+ 1 35.1	291 32.6	125	+20 11.6	+108
1	345 31.3	180 49.5	27.5	220 01.5	30.2	332 24.2	56.9	163 44.1	35.0	306 04.1	124	20 22.4	+108
2	0 33.7	195 53.0	27.5	235 02.3	29.9	347 26.8	56.8	178 46.4	34.8	320 35.5	124	20 33.2	+106
3	15 36.2	210 56.5	·· 27.5	250 03.1	·· 29.5	2 29.4	·· 56.8	193 48.6	·· 34.7	335 06.9	123	·20 43.8	+105
4	30 38.7	226 00.0	27.6	265 03.9	29.2	17 32.0	56.7	208 50.8	34.6	349 38.2	123	20 54.3	+104
5	45 41.1	241 03.5	27.6	280 04.7	28.8	32 34.6	56.6	223 53.0	34.5	4 09.5	123	21 04.7	+103
6	60 43.6	256 07.0	− 1 27.6	295 05.5	+20 28.5	47 37.2	+ 3 56.5	238 55.2	+ 1 34.4	18 40.8	122	+21 15.0	+101
7	75 46.0	271 10.5	27.6	310 06.3	28.1	62 39.8	56.5	253 57.4	34.3	33 12.0	122	21 25.1	+101
8	90 48.5	286 14.0	27.7	325 07.1	27.8	77 42.4	56.4	268 59.6	34.2	47 43.2	121	21 35.2	+100
9	105 51.0	301 17.5	·· 27.7	340 07.9	·· 27.4	92 45.0	·· 56.3	284 01.8	·· 34.0	62 14.3	121	·21 45.2	+ 99
10	120 53.4	316 21.1	27.7	355 08.7	27.1	107 47.6	56.3	299 04.0	33.9	76 45.4	121	21 55.1	+ 97
11	135 55.9	331 24.6	27.7	10 09.5	26.7	122 50.2	56.2	314 06.3	33.8	91 16.5	120	22 04.8	+ 97
12	150 58.4	346 28.1	− 1 27.7	25 10.3	+20 26.3	137 52.8	+ 3 56.1	329 08.5	+ 1 33.7	105 47.5	119	+22 14.5	+ 95
13	166 00.8	1 31.6	27.7	40 11.1	26.0	152 55.4	56.1	344 10.7	33.6	120 18.4	120	22 24.0	+ 94
14	181 03.3	16 35.2	27.7	55 11.9	25.6	167 58.0	56.0	359 12.9	33.5	134 49.4	118	22 33.4	+ 93
15	196 05.8	31 38.7	·· 27.7	70 12.7	·· 25.3	183 00.6	·· 55.9	14 15.1	·· 33.4	149 20.2	119	·22 42.7	+ 93
16	211 08.2	46 42.2	27.7	85 13.4	24.9	198 03.2	55.9	29 17.3	33.3	163 51.1	118	22 52.0	+ 90
17	226 10.7	61 45.8	27.7	100 14.2	24.6	213 05.8	55.8	44 19.5	33.1	178 21.9	117	23 01.0	+ 90
18	241 13.2	76 49.3	− 1 27.7	115 15.0	+20 24.2	228 08.4	+ 3 55.7	59 21.7	+ 1 33.0	192 52.6	117	+23 10.0	+ 89
19	256 15.6	91 52.9	27.7	130 15.8	23.8	243 11.0	55.6	74 23.9	32.9	207 23.3	117	23 18.9	+ 87
20	271 18.1	106 56.4	27.7	145 16.6	23.5	258 13.6	55.6	89 26.1	32.8	221 54.0	116	23 27.6	+ 87
21	286 20.5	122 00.0	·· 27.7	160 17.4	·· 23.1	273 16.2	·· 55.5	104 28.3	·· 32.7	236 24.6	116	·23 36.3	+ 85
22	301 23.0	137 03.5	27.7	175 18.2	22.8	288 18.8	55.4	119 30.6	32.6	250 55.2	115	23 44.8	+ 84
23	316 25.5	152 07.1	27.7	190 19.0	22.4	303 21.4	55.4	134 32.8	32.5	265 25.7	115	23 53.2	+ 83
0	331 27.9	167 10.7	− 1 27.7	205 19.8	+20 22.1	318 24.0	+ 3 55.3	149 35.0	+ 1 32.3	279 56.2	115	+24 01.5	+ 82
1	346 30.4	182 14.2	27.7	220 20.6	21.7	333 26.6	55.2	164 37.2	32.2	294 26.7	114	24 09.7	+ 80
2	1 32.9	197 17.8	27.7	235 21.4	21.3	348 29.2	55.1	179 39.4	32.1	308 57.1	113	24 17.7	+ 79
3	16 35.3	212 21.4	·· 27.6	250 22.2	·· 21.0	3 31.9	·· 55.1	194 41.6	·· 32.0	323 27.4	114	·24 25.6	+ 79
4	31 37.8	227 24.9	27.6	265 23.0	20.6	18 34.5	55.0	209 43.8	31.9	337 57.8	112	24 33.5	+ 77
5	46 40.3	242 28.5	27.6	280 23.8	20.3	33 37.1	54.9	224 46.0	31.8	352 28.0	113	24 41.2	+ 75
6	61 42.7	257 32.1	− 1 27.6	295 24.6	+20 19.9	48 39.7	+ 3 54.9	239 48.2	+ 1 31.7	6 58.3	112	+24 48.7	+ 75
7	76 45.2	272 35.7	27.5	310 25.4	19.5	63 42.3	54.8	254 50.4	31.5	21 28.5	111	24 56.2	+ 73
8	91 47.6	287 39.3	27.5	325 26.2	19.2	78 44.9	54.7	269 52.6	31.4	35 58.6	111	25 03.5	+ 72
9	106 50.1	302 42.9	·· 27.5	340 27.0	·· 18.8	93 47.5	·· 54.6	284 54.9	·· 31.3	50 28.7	111	·25 10.7	+ 71
10	121 52.6	317 46.4	27.4	355 27.8	18.5	108 50.1	54.6	299 57.1	31.2	64 58.8	110	25 17.8	+ 70
11	136 55.0	332 50.0	27.4	10 28.6	18.1	123 52.7	54.5	314 59.3	31.1	79 28.8	110	25 24.8	+ 68
12	151 57.5	347 53.6	− 1 27.4	25 29.4	+20 17.7	138 55.3	+ 3 54.4	330 01.5	+ 1 31.0	93 58.8	110	+25 31.6	+ 67
13	167 00.0	2 57.2	27.3	40 30.2	17.4	153 58.0	54.4	345 03.7	30.9	108 28.8	109	25 38.3	+ 66
14	182 02.4	18 00.8	27.3	55 31.0	17.0	169 00.6	54.3	0 05.9	30.7	122 58.7	109	25 44.9	+ 65
15	197 04.9	33 04.4	·· 27.2	70 31.8	·· 16.6	184 03.2	·· 54.2	15 08.1	·· 30.6	137 28.6	108	·25 51.4	+ 64
16	212 07.4	48 08.0	27.2	85 32.6	16.3	199 05.8	54.1	30 10.3	30.5	151 58.4	108	25 57.8	+ 62
17	227 09.8	63 11.7	27.1	100 33.4	15.9	214 08.4	54.1	45 12.5	30.4	166 28.2	108	26 04.0	+ 61
18	242 12.3	78 15.3	− 1 27.1	115 34.2	+20 15.6	229 11.0	+ 3 54.0	60 14.7	+ 1 30.3	180 58.0	107	+26 10.1	+ 59
19	257 14.8	93 18.9	27.0	130 35.0	15.2	244 13.6	53.9	75 16.9	30.2	195 27.7	107	26 16.0	+ 59
20	272 17.2	108 22.5	27.0	145 35.8	14.8	259 16.2	53.8	90 19.1	30.1	209 57.4	106	26 21.9	+ 57
21	287 19.7	123 26.1	·· 26.9	160 36.6	·· 14.5	274 18.8	·· 53.8	105 21.4	·· 29.9	224 27.0	106	·26 27.6	+ 56
22	302 22.1	138 29.7	26.8	175 37.4	14.1	289 21.5	53.7	120 23.6	29.8	238 56.6	106	26 33.2	+ 54
23	317 24.6	153 33.4	26.8	190 38.2	13.7	304 24.1	53.6	135 25.8	29.7	253 26.2	106	26 38.6	+ 53
0	332 27.1	168 37.0	− 1 26.7	205 39.0	+20 13.4	319 26.7	+ 3 53.5	150 28.0	+ 1 29.6	267 55.8	105	+26 43.9	+ 52
1	347 29.5	183 40.6	26.7	220 39.8	13.0	334 29.3	53.5	165 30.2	29.5	282 25.3	104	26 49.1	+ 51
2	2 32.0	198 44.3	26.6	235 40.6	12.6	349 31.9	53.4	180 32.4	29.4	296 54.7	105	26 54.2	+ 49
3	17 34.5	213 47.9	·· 26.5	250 41.4	·· 12.3	4 34.5	·· 53.3	195 34.6	·· 29.3	311 24.2	104	·26 59.1	+ 48
4	32 36.9	228 51.5	26.4	265 42.2	11.9	19 37.1	53.3	210 36.8	29.1	325 53.6	104	27 03.9	+ 47
5	47 39.4	243 55.2	26.4	280 43.0	11.5	34 39.8	53.2	225 39.0	29.0	340 23.0	103	27 08.6	+ 45
6	62 41.9	258 58.8	− 1 26.3	295 43.8	+20 11.2	49 42.4	+ 3 53.1	240 41.2	+ 1 28.9	354 52.3	104	+27 13.1	+ 45
7	77 44.3	274 02.5	26.2	310 44.6	10.8	64 45.0	53.0	255 43.4	28.8	9 21.7	103	27 17.6	+ 42
8	92 46.8	289 06.1	26.1	325 45.4	10.4	79 47.6	53.0	270 45.6	28.7	23 51.0	102	27 21.8	+ 42
9	107 49.3	304 09.8	·· 26.0	340 46.2	·· 10.1	94 50.2	·· 52.9	285 47.8	·· 28.6	38 20.2	103	·27 26.0	+ 40
10	122 51.7	319 13.4	25.9	355 47.0	09.7	109 52.8	52.8	300 50.0	28.4	52 49.5	102	27 30.0	+ 39
11	137 54.2	334 17.1	25.9	10 47.8	09.3	124 55.5	52.7	315 52.3	28.3	67 18.7	102	27 33.9	+ 37
12	152 56.6	349 20.8	− 1 25.8	25 48.6	+20 09.0	139 58.1	+ 3 52.7	330 54.5	+ 1 28.2	81 47.9	101	+27 37.6	+ 36
13	167 59.1	4 24.4	25.7	40 49.4	08.6	155 00.7	52.6	345 56.7	28.1	96 17.0	102	27 41.2	+ 35
14	183 01.6	19 28.1	25.6	55 50.2	08.2	170 03.3	52.5	0 58.9	28.0	110 46.2	101	27 44.7	+ 33
15	198 04.0	34 31.8	·· 25.5	70 51.0	·· 07.9	185 05.9	·· 52.4	16 01.1	·· 27.9	125 15.3	101	·27 48.0	+ 33
16	213 06.5	49 35.4	25.4	85 51.8	07.5	200 08.6	52.3	31 03.3	27.8	139 44.4	100	27 51.3	+ 30
17	228 09.0	64 39.1	25.3	100 52.6	07.1	215 11.2	52.3	46 05.5	27.6	154 13.4	101	27 54.3	+ 30
18	243 11.4	79 42.8	− 1 25.2	115 53.4	+20 06.8	230 13.8	+ 3 52.2	61 07.7	+ 1 27.5	168 42.5	100	+27 57.3	+ 28
19	258 13.9	94 46.4	25.1	130 54.2	06.4	245 16.4	52.1	76 09.9	27.4	183 11.5	100	28 00.1	+ 26
20	273 16.4	109 50.1	25.0	145 55.0	06.0	260 19.0	52.0	91 12.1	27.3	197 40.5	100	28 02.7	+ 26
21	288 18.8	124 53.8	·· 24.9	160 55.8	·· 05.7	275 21.6	·· 52.0	106 14.3	·· 27.2	212 09.5	100	·28 05.3	+ 24
22	303 21.3	139 57.5	24.7	175 56.6	05.3	290 24.3	51.9	121 16.5	27.1	226 38.5	100	28 07.7	+ 22
23	318 23.8	155 01.2	24.6	190 57.4	04.9	305 26.9	51.8	136 18.7	27.0	241 07.5	99	28 09.9	+ 21
24	333 26.2	170 04.9	− 1 24.5	205 58.2	+20 04.5	320 29.5	+ 3 51.7	151 20.9	+ 1 26.8	255 36.4	99	+28 12.0	+ 20
code	–	+ 36	+ 1	+ 8	− 3	+ 27	0	+ 22	− 1				

GCT h	SUN GHA ° ′	SUN Dec. ° ′
23		
0	179 17.0	+11 48.2
1	194 17.2	47.4
2	209 17.4	46.5
3	224 17.5	·· 45.7
4	239 17.7	44.9
5	254 17.8	44.0
6	269 18.0	+11 43.2
7	284 18.2	42.3
8	299 18.3	41.5
9	314 18.5	·· 40.6
10	329 18.6	39.8
11	344 18.8	39.0
12	359 19.0	+11 38.1
13	14 19.1	37.3
14	29 19.3	36.4
15	44 19.4	·· 35.6
16	59 19.6	34.7
17	74 19.8	33.9
18	89 19.9	+11 33.0
19	104 20.1	32.2
20	119 20.2	31.4
21	134 20.4	·· 30.5
22	149 20.6	29.7
23	164 20.7	28.8
24		
0	179 20.9	+11 28.0
1	194 21.1	27.1
2	209 21.2	26.3
3	224 21.4	·· 25.4
4	239 21.5	24.6
5	254 21.7	23.7
6	269 21.9	+11 22.9
7	284 22.0	22.0
8	299 22.2	21.2
9	314 22.4	·· 20.3
10	329 22.5	19.5
11	344 22.7	18.6
12	359 22.8	+11 17.8
13	14 23.0	16.9
14	29 23.2	16.1
15	44 23.3	·· 15.2
16	59 23.5	14.4
17	74 23.7	13.5
18	89 23.8	+11 12.7
19	104 24.0	11.8
20	119 24.2	11.0
21	134 24.3	·· 10.1
22	149 24.5	09.2
23	164 24.7	08.4
25		
0	179 24.8	+11 07.5
1	194 25.0	06.7
2	209 25.2	05.8
3	224 25.3	·· 05.0
4	239 25.5	04.1
5	254 25.7	03.3
6	269 25.8	+11 02.4
7	284 26.0	01.5
8	299 26.2	11 00.7
9	314 26.3	·10 59.8
10	329 26.5	59.0
11	344 26.7	58.1
12	359 26.8	+10 57.3
13	14 27.0	56.4
14	29 27.2	55.5
15	44 27.4	·· 54.7
16	59 27.5	53.8
17	74 27.7	53.0
18	89 27.9	+10 52.1
19	104 28.0	51.2
20	119 28.2	50.4
21	134 28.4	·· 49.5
22	149 28.5	48.6
23	164 28.7	47.8
24	179 28.9	+10 46.9
code	—	− 9

STARS No.	SHA ° ′	Dec. ° ′	Transit Mer. Gr. h m
1	358 31.4	+28 49.5	2 00
2	358 20.9	+58 52.9	2 00
3	349 42.2	−18 14.9	2 35
4	339 20.2	+59 59.0	3 16
5	336 00.6	−57 28.5	3 30
6	332 28.3	+89 02.1	3 44
7	328 53.2	+23 14.2	3 58
8	315 53.3	−40 29.4	4 50
9	309 47.0	+49 41.4	5 14
10	291 42.8	+16 25.0	6 26
11	281 56.8	− 8 15.0	7 05
12	281 43.4	+45 57.1	7 06
13	279 22.0	+ 6 18.7	7 15
14	279 11.5	+28 34.2	7 16
15	276 33.7	− 1 13.6	7 27
16	271 51.8	+ 7 24.2	7 45
17	264 17.1	−52 39.7	8 16
18	259 14.9	−16 38.6	8 36
19	255 49.3	−28 54.0	8 49
20	245 48.6	+ 5 21.2	9 29
21	244 24.8	+28 08.8	9 35
22	234 37.8	−59 20.9	10 14
23	223 27.2	−43 14.0	10 59
24	221 51.0	−69 30.9	11 05
25	218 42.1	− 8 26.7	11 17
26	208 33.2	+12 12.4	11 58
27	194 48.9	+62 00.9	12 53
28	183 21.2	+14 50.7	13 38
29	174 02.3	−62 50.1	14 16
30	172 53.5	−56 50.7	14 20
31	168 47.4	−59 25.7	14 37
32	167 01.5	+56 13.5	14 44
33	159 30.4	+55 10.8	15 14
34	159 20.5	−10 54.6	15 14
35	153 35.5	+49 33.4	15 37
36	149 02.7	−36 08.2	15 55
37	146 38.2	+19 26.1	16 05
38	140 55.9	−60 38.6	16 28
39	137 17.6	+74 21.4	16 42
40	126 50.3	+26 52.7	17 24
41	120 37.9	−22 29.3	17 49
42	113 23.3	−26 19.8	18 18
43	109 06.9	−68 56.9	18 35
44	103 05.8	−15 40.1	18 59
45	97 24.9	−37 04.5	19 21
46	96 49.4	+12 35.7	19 24
47	91 07.5	+51 29.8	19 46
48	84 45.2	−34 24.8	20 12
49	81 10.2	+38 44.4	20 26
50	76 55.6	−26 21.6	20 43
51	62 53.3	+ 8 44.4	21 39
52	54 31.7	−56 53.7	22 12
53	50 02.9	+45 06.5	22 30
54	34 32.4	+ 9 39.2	23 32
55	28 41.3	−47 11.7	23 55
56	16 14.7	−29 52.6	0 49
57	14 24.4	+14 56.8	0 56

Lat. °	Sunrise h m	Twlt. begins h m	Moonrise 23 h m	Moonrise 24 h m	Moonrise 25 h m	Moonrise 26 h m
N 70	3 36	////	□	□	□	□
68	3 53	////	□	□	□	□
66	4 06	////	18 15	□	□	□
64	4 17	////	19 04	□	□	□
62	4 26	////	19 35	19 28	19 07	□
60	4 34	0 45	19 59	20 05	20 23	21 06
58	4 41	1 35	20 18	20 32	20 58	21 45
56	4 47	2 02	20 34	20 53	21 24	22 12
54	4 52	2 24	20 47	21 10	21 45	22 33
52	4 57	2 40	20 59	21 25	22 02	22 51
50	5 02	2 53	21 10	21 38	22 17	23 06
45	5 11	3 20	21 32	22 05	22 46	23 37
40	5 19	3 39	21 50	22 26	23 10	24 00
35	5 26	3 55	22 05	22 44	23 29	24 20
30	5 32	4 07	22 18	22 59	23 46	24 37
20	5 42	4 26	22 41	23 25	24 14	0 14
10	5 51	4 39	23 01	23 48	24 38	0 38
0	5 59	4 49	23 19	24 09	0 09	1 00
10	6 07	4 57	23 38	24 30	0 30	1 23
20	6 16	5 03	23 58	24 53	0 53	1 47
30	6 25	5 06	24 21	0 21	1 20	2 15
35	6 31	5 07	24 35	0 35	1 35	2 32
40	6 37	5 07	24 51	0 51	1 54	2 51
45	6 44	5 08	0 01	1 10	2 16	3 15
50	6 52	5 07	0 20	1 34	2 44	3 46
52	6 56	5 06	0 29	1 45	2 58	4 01
54	7 00	5 04	0 39	1 59	3 14	4 19
56	7 05	5 03	0 50	2 14	3 33	4 41
58	7 10	5 01	1 03	2 32	3 57	5 09
S 60	7 16	4 59	1 18	2 55	4 29	5 49

Lat. °	Sunset h m	Twlt. ends h m	Moonset 23 h m	Moonset 24 h m	Moonset 25 h m	Moonset 26 h m
N 70	20 25	////	□	□	□	□
68	20 09	////	□	□	□	□
66	19 57	////	15 44	□	□	□
64	19 46	////	14 57	□	□	□
62	19 37	////	14 26	16 16	18 23	□
60	19 30	23 07	14 04	15 39	17 08	18 12
58	19 23	22 24	13 45	15 13	16 32	17 33
56	19 17	21 57	13 30	14 52	16 06	17 06
54	19 11	21 37	13 17	14 35	15 46	16 44
52	19 07	21 22	13 06	14 21	15 29	16 26
50	19 02	21 08	12 55	14 08	15 15	16 11
45	18 53	20 42	12 34	13 42	14 45	15 41
40	18 45	20 23	12 17	13 21	14 22	15 17
35	18 38	20 08	12 03	13 04	14 03	14 57
30	18 33	19 57	11 51	12 50	13 47	14 40
20	18 23	19 39	11 29	12 25	13 19	14 12
10	18 14	19 26	11 11	12 03	12 56	13 48
0	18 06	19 16	10 54	11 43	12 34	13 25
10	17 58	19 09	10 37	11 23	12 12	13 02
20	17 50	19 04	10 19	11 02	11 48	12 38
30	17 40	19 00	9 59	10 37	11 21	12 09
35	17 35	19 00	9 47	10 23	11 05	11 52
40	17 29	19 00	9 33	10 06	10 46	11 33
45	17 22	19 00	9 17	9 46	10 23	11 09
50	17 14	19 02	8 57	9 22	9 54	10 38
52	17 10	19 03	8 47	9 10	9 40	10 23
54	17 05	19 04	8 37	8 56	9 24	10 05
56	17 01	19 06	8 25	8 40	9 04	9 43
58	16 56	19 08	8 11	8 21	8 40	9 15
S 60	16 50	19 10	7 55	7 58	8 08	8 35

GCT h	Equation of Time (App.—Mean) 23 m s	24 m s	25 m s
0	− 2 52.1	− 2 36.8	− 2 21.0
6	− 2 48.3	− 2 32.9	− 2 17.0
12	− 2 44.5	− 2 28.9	− 2 12.9
18	− 2 40.7	− 2 25.0	− 2 08.9
24	− 2 36.8	− 2 21.0	− 2 04.8

GCT of Transit Meridian of Greenwich

DAY	Moon h m	Venus h m	Mars h m	Jupiter h m	Saturn h m
23	4 43	12 54	10 19	2 50	14 03
24	5 31	12 48	10 18	2 46	14 00
25	6 21	12 42	10 17	2 42	13 56
26	7 13	12 37	10 16	2 38	13 53

ADDITIONAL ALTITUDE CORRECTIONS

Alt. °	Sun's Low'r Limb ′	Venus ′	Mars ′
0	0.1	0.5	0.1
30	0.1	0.4	0.0
45	0.1	0.3	0.0
60	0.1	0.2	0.0
75	0.1	0.1	0.0
90			

Moon's Lower Limb
Add

Alt. °	23 ′	24 ′	25 ′
0	13.3	12.6	12.2
4	13.3	12.6	12.3
8	13.3	12.7	12.3
12	13.3	12.7	12.3
16	13.3	12.7	12.4
20	13.4	12.8	12.4
24	13.4	12.9	12.5
28	13.5	12.9	12.6
32	13.6	13.0	12.7
36	13.6	13.1	12.8
40	13.7	13.2	12.9
44	13.8	13.3	13.0
48	13.9	13.4	13.2
52	14.0	13.6	13.3
56	14.1	13.7	13.5
60	14.2	13.8	13.6
64	14.3	14.0	13.8
68	14.4	14.1	14.0
72	14.6	14.3	14.1
76	14.7	14.4	14.3
80	14.8	14.6	14.5
84	14.9	14.8	14.7
88	15.0	14.9	14.8
90			

Add to table, back cover

Moon's Upper Limb
Subtract

Alt. °	23 ′	24 ′	25 ′
0	16.9	17.2	17.4
4	16.8	17.2	17.4
8	16.8	17.2	17.4
12	16.8	17.2	17.4
16	16.8	17.1	17.3
20	16.7	17.1	17.3
24	16.7	17.0	17.2
28	16.6	16.9	17.1
32	16.6	16.8	17.0
36	16.5	16.7	16.9
40	16.4	16.6	16.8
44	16.3	16.5	16.6
48	16.2	16.4	16.5
52	16.1	16.3	16.4
56	16.0	16.1	16.2
60	15.9	16.0	16.1
64	15.8	15.9	15.9
68	15.7	15.7	15.7
72	15.6	15.6	15.6
76	15.4	15.4	15.4
80	15.3	15.2	15.2
84	15.2	15.1	15.0
88	15.1	15.0	14.9
90			

Subtract from table, back cover

Last Quarter 24

GCT	♈	VENUS −3.5		MARS 1.9		JUPITER −2.4		SATURN 1.2		MOON			
	GHA	GHA	Dec.	GHA	Dec.	GHA	Dec.	GHA	Dec.	GHA	code	Dec.	code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
0	333 26.2	170 04.9	− 1 24.5	205 58.2	+20 04.5	320 29.5	+ 3 51.7	151 20.9	+ 1 26.8	255 36.4	99	+28 12.0	+ 20
1	348 28.7	185 08.6	24.4	220 59.1	04.2	335 32.1	51.7	166 23.1	26.7	270 05.3	100	28 14.0	+ 19
2	3 31.1	200 12.3	24.3	235 59.9	03.8	350 34.8	51.6	181 25.4	26.6	284 34.3	99	28 15.9	+ 17
3	18 33.6	215 16.0	·· 24.1	251 00.7	·· 03.4	5 37.4	·· 51.5	196 27.6	·· 26.5	299 03.2	99	·28 17.6	+ 16
4	33 36.1	230 19.7	24.0	266 01.5	03.1	20 40.0	51.4	211 29.8	26.4	313 32.1	98	28 19.2	+ 14
5	48 38.5	245 23.4	23.9	281 02.3	02.7	35 42.6	51.4	226 32.0	26.3	328 00.9	99	28 20.6	+ 13
6	63 41.0	260 27.1	− 1 23.8	296 03.1	+20 02.3	50 45.2	+ 3 51.3	241 34.2	+ 1 26.1	342 29.8	99	+28 21.9	+ 12
7	78 43.5	275 30.8	23.6	311 03.9	01.9	65 47.9	51.2	256 36.4	26.0	356 58.7	99	28 23.1	+ 10
8	93 45.9	290 34.5	23.5	326 04.7	01.6	80 50.5	51.1	271 38.6	25.9	11 27.6	98	28 24.1	+ 9
9	108 48.4	305 38.2	·· 23.4	341 05.5	·· 01.2	95 53.1	·· 51.0	286 40.8	·· 25.8	25 56.4	99	·28 25.0	+ 7
10	123 50.9	320 41.9	23.2	356 06.3	00.8	110 55.7	51.0	301 43.0	25.7	40 25.3	98	28 25.7	+ 6
11	138 53.3	335 45.6	23.1	11 07.1	00.5	125 58.4	50.9	316 45.2	25.6	54 54.1	99	28 26.3	+ 5
12	153 55.8	350 49.3	− 1 22.9	26 07.9	+20 00.1	141 01.0	+ 3 50.8	331 47.4	+ 1 25.5	69 23.0	98	+28 26.8	+ 3
13	168 58.2	5 53.1	22.8	41 08.7	19 59.7	156 03.6	50.7	346 49.6	25.3	83 51.8	99	28 27.1	+ 2
14	184 00.7	20 56.8	22.7	56 09.5	59.3	171 06.2	50.7	1 51.8	25.2	98 20.7	98	28 27.3	+ 1
15	199 03.2	36 00.5	·· 22.5	71 10.3	·· 59.0	186 08.9	·· 50.6	16 54.0	·· 25.1	112 49.5	99	·28 27.4	− 1
16	214 05.6	51 04.2	22.4	86 11.2	58.6	201 11.5	50.5	31 56.2	25.0	127 18.4	98	28 27.3	− 2
17	229 08.1	66 08.0	22.2	101 12.0	58.2	216 14.1	50.4	46 58.4	24.9	141 47.2	99	28 27.1	− 3
18	244 10.6	81 11.7	− 1 22.0	116 12.8	+19 57.8	231 16.7	+ 3 50.3	62 00.6	+ 1 24.8	156 16.1	98	+28 26.8	− 5
19	259 13.0	96 15.4	21.9	131 13.6	57.5	246 19.4	50.3	77 02.8	24.6	170 44.9	99	28 26.3	− 7
20	274 15.5	111 19.2	21.7	146 14.4	57.1	261 22.0	50.2	92 05.1	24.5	185 13.8	99	28 25.6	− 7
21	289 18.0	126 22.9	·· 21.6	161 15.2	·· 56.7	276 24.6	·· 50.1	107 07.3	·· 24.4	199 42.7	99	·28 24.9	− 9
22	304 20.4	141 26.6	21.4	176 16.0	56.3	291 27.2	50.0	122 09.5	24.3	214 11.6	98	28 24.0	− 11
23	319 22.9	156 30.4	21.2	191 16.8	56.0	306 29.9	49.9	137 11.7	24.2	228 40.4	100	28 22.9	− 11
0	334 25.4	171 34.1	− 1 21.1	206 17.6	+19 55.6	321 32.5	+ 3 49.9	152 13.9	+ 1 24.1	243 09.4	99	+28 21.8	− 13
1	349 27.8	186 37.9	20.9	221 18.4	55.2	336 35.1	49.8	167 16.1	24.0	257 38.3	99	28 20.5	− 15
2	4 30.3	201 41.6	20.7	236 19.3	54.8	351 37.8	49.7	182 18.3	23.8	272 07.2	99	28 19.0	− 16
3	19 32.7	216 45.4	·· 20.6	251 20.1	·· 54.5	6 40.4	·· 49.6	197 20.5	·· 23.7	286 36.1	100	·28 17.4	− 17
4	34 35.2	231 49.1	20.4	266 20.9	54.1	21 43.0	49.6	212 22.7	23.6	301 05.1	100	28 15.7	− 19
5	49 37.7	246 52.9	20.2	281 21.7	53.7	36 45.6	49.5	227 24.9	23.5	315 34.1	100	28 13.8	− 20
6	64 40.1	261 56.7	− 1 20.0	296 22.5	+19 53.3	51 48.3	+ 3 49.4	242 27.1	+ 1 23.4	330 03.1	100	+28 11.8	− 21
7	79 42.6	277 00.4	19.8	311 23.3	53.0	66 50.9	49.3	257 29.3	23.3	344 32.1	100	28 09.7	− 23
8	94 45.1	292 04.2	19.7	326 24.1	52.6	81 53.5	49.2	272 31.5	23.1	359 01.1	100	28 07.4	− 24
9	109 47.5	307 07.9	·· 19.5	341 24.9	·· 52.2	96 56.2	·· 49.2	287 33.7	·· 23.0	13 30.1	101	·28 05.0	− 25
10	124 50.0	322 11.7	19.3	356 25.7	51.8	111 58.8	49.1	302 35.9	22.9	27 59.2	101	28 02.5	− 27
11	139 52.5	337 15.5	19.1	11 26.6	51.4	127 01.4	49.0	317 38.1	22.8	42 28.3	101	27 59.8	− 28
12	154 54.9	352 19.2	− 1 18.9	26 27.4	+19 51.1	142 04.1	+ 3 48.9	332 40.3	+ 1 22.7	56 57.4	101	+27 57.0	− 29
13	169 57.4	7 23.0	18.7	41 28.2	50.7	157 06.7	48.8	347 42.5	22.6	71 26.5	102	27 54.1	− 31
14	184 59.9	22 26.8	18.5	56 29.0	50.3	172 09.3	48.7	2 44.7	22.4	85 55.7	102	27 51.0	− 32
15	200 02.3	37 30.6	·· 18.3	71 29.8	·· 49.9	187 11.9	·· 48.7	17 46.9	·· 22.3	100 24.9	102	·27 47.8	− 34
16	215 04.8	52 34.3	18.1	86 30.6	49.5	202 14.6	48.6	32 49.1	22.2	114 54.1	102	27 44.4	− 34
17	230 07.2	67 38.1	17.9	101 31.4	49.2	217 17.2	48.5	47 51.3	22.1	129 23.3	103	27 41.0	− 36
18	245 09.7	82 41.9	− 1 17.7	116 32.2	+19 48.8	232 19.8	+ 3 48.4	62 53.5	+ 1 22.0	143 52.6	103	+27 37.4	− 38
19	260 12.2	97 45.7	17.5	131 33.1	48.4	247 22.5	48.3	77 55.8	21.9	158 21.9	103	27 33.6	− 39
20	275 14.6	112 49.5	17.3	146 33.9	48.0	262 25.1	48.3	92 58.0	21.8	172 51.2	104	27 29.7	− 40
21	290 17.1	127 53.3	·· 17.1	161 34.7	·· 47.6	277 27.7	·· 48.2	108 00.2	·· 21.6	187 20.6	104	·27 25.7	− 41
22	305 19.6	142 57.0	16.9	176 35.5	47.3	292 30.4	48.1	123 02.4	21.5	201 50.0	104	27 21.6	− 43
23	320 22.0	158 00.8	16.6	191 36.3	46.9	307 33.0	48.0	138 04.6	21.4	216 19.4	105	27 17.3	− 44
0	335 24.5	173 04.6	− 1 16.4	206 37.1	+19 46.5	322 35.7	+ 3 47.9	153 06.8	+ 1 21.3	230 48.9	105	+27 12.9	− 45
1	350 27.0	188 08.4	16.2	221 37.9	46.1	337 38.3	47.9	168 09.0	21.2	245 18.4	105	27 08.4	− 46
2	5 29.4	203 12.2	16.0	236 38.8	45.7	352 40.9	47.8	183 11.2	21.1	259 47.9	106	27 03.8	− 48
3	20 31.9	218 16.0	·· 15.8	251 39.6	·· 45.4	7 43.6	·· 47.7	198 13.4	·· 20.9	274 17.5	106	·26 59.0	− 50
4	35 34.4	233 19.8	15.5	266 40.4	45.0	22 46.2	47.6	213 15.6	20.8	288 47.1	106	26 54.0	− 50
5	50 36.8	248 23.6	15.3	281 41.2	44.6	37 48.8	47.5	228 17.8	20.7	303 16.7	107	26 49.0	− 52
6	65 39.3	263 27.4	− 1 15.1	296 42.0	+19 44.2	52 51.5	+ 3 47.4	243 20.0	+ 1 20.6	317 46.4	107	+26 43.8	− 53
7	80 41.7	278 31.2	14.8	311 42.8	43.8	67 54.1	47.4	258 22.2	20.5	332 16.1	108	26 38.5	− 54
8	95 44.2	293 35.1	14.6	326 43.6	43.4	82 56.7	47.3	273 24.4	20.4	346 45.9	108	26 33.1	− 55
9	110 46.7	308 38.9	·· 14.4	341 44.5	·· 43.1	97 59.4	·· 47.2	288 26.6	·· 20.2	1 15.7	108	·26 27.6	− 57
10	125 49.1	323 42.7	14.1	356 45.3	42.7	113 02.0	47.1	303 28.8	20.1	15 45.5	109	26 21.9	− 58
11	140 51.6	338 46.5	13.9	11 46.1	42.3	128 04.6	47.0	318 31.0	20.0	30 15.4	109	26 16.1	− 60
12	155 54.1	353 50.3	− 1 13.6	26 46.9	+19 41.9	143 07.3	+ 3 46.9	333 33.2	+ 1 19.9	44 45.3	110	+26 10.1	− 60
13	170 56.5	8 54.1	13.4	41 47.7	41.5	158 09.9	46.9	348 35.4	19.8	59 15.3	110	26 04.1	− 62
14	185 59.0	23 57.9	13.2	56 48.5	41.1	173 12.6	46.8	3 37.6	19.7	73 45.3	111	25 57.9	− 63
15	201 01.5	39 01.8	·· 12.9	71 49.4	·· 40.8	188 15.2	·· 46.7	18 39.8	·· 19.5	88 15.4	111	·25 51.6	− 64
16	216 03.9	54 05.6	12.7	86 50.2	40.4	203 17.8	46.6	33 42.0	19.4	102 45.5	111	25 45.2	− 65
17	231 06.4	69 09.4	12.4	101 51.0	40.0	218 20.5	46.5	48 44.2	19.3	117 15.6	112	25 38.7	− 67
18	246 08.9	84 13.2	− 1 12.1	116 51.8	+19 39.6	233 23.1	+ 3 46.4	63 46.4	+ 1 19.2	131 45.8	112	+25 32.0	− 68
19	261 11.3	99 17.0	11.9	131 52.6	39.2	248 25.8	46.4	78 48.6	19.1	146 16.0	113	25 25.2	− 69
20	276 13.8	114 20.9	11.6	146 53.5	38.8	263 28.4	46.3	93 50.8	19.0	160 46.3	113	25 18.3	− 70
21	291 16.2	129 24.7	·· 11.4	161 54.3	·· 38.4	278 31.0	·· 46.2	108 53.0	·· 18.8	175 16.6	114	·25 11.3	− 72
22	306 18.7	144 28.5	11.1	176 55.1	38.1	293 33.7	46.1	123 55.2	18.7	189 47.0	114	25 04.1	− 72
23	321 21.2	159 32.4	10.8	191 55.9	37.7	308 36.3	46.0	138 57.4	18.6	204 17.4	115	24 56.9	− 74
24	336 23.6	174 36.2	− 1 10.6	206 56.7	+19 37.3	323 39.0	+ 3 45.9	153 59.6	+ 1 18.5	218 47.9	115	+24 49.5	− 75
code	−	+ 38	+ 2	+ 8	− 4	+ 26	− 1	+ 22	− 1				

GCT	SUN GHA	SUN Dec.
h	° ′	° ′
0	179 28.9	+10 46.9
1	194 29.1	46.1
2	209 29.2	45.2
3	224 29.4	·· 44.3
4	239 29.6	43.5
5	254 29.7	42.6
6	269 29.9	+10 41.7
7	284 30.1	40.9
8	299 30.3	40.0
9	314 30.4	·· 39.1
10	329 30.6	38.3
11	344 30.8	37.4
12	359 30.9	+10 36.6
13	14 31.1	35.7
14	29 31.3	34.8
15	44 31.5	·· 34.0
16	59 31.6	33.1
17	74 31.8	32.2
18	89 32.0	+10 31.3
19	104 32.2	30.5
20	119 32.3	29.6
21	134 32.5	·· 28.7
22	149 32.7	27.9
23	164 32.9	27.0
0	179 33.0	+10 26.1
1	194 33.2	25.3
2	209 33.4	24.4
3	224 33.6	·· 23.5
4	239 33.7	22.7
5	254 33.9	21.8
6	269 34.1	+10 20.9
7	284 34.3	20.0
8	299 34.4	19.2
9	314 34.6	·· 18.3
10	329 34.8	17.4
11	344 35.0	16.6
12	359 35.1	+10 15.7
13	14 35.3	14.8
14	29 35.5	13.9
15	44 35.7	·· 13.1
16	59 35.8	12.2
17	74 36.0	11.3
18	89 36.2	+10 10.4
19	104 36.4	09.6
20	119 36.6	08.7
21	134 36.7	·· 07.8
22	149 36.9	06.9
23	164 37.1	06.1
0	179 37.3	+10 05.2
1	194 37.5	04.3
2	209 37.6	03.4
3	224 37.8	·· 02.6
4	239 38.0	01.7
5	254 38.2	10 00.8
6	269 38.3	+ 9 59.9
7	284 38.5	59.0
8	299 38.7	58.2
9	314 38.9	·· 57.3
10	329 39.1	56.4
11	344 39.2	55.5
12	359 39.4	+ 9 54.6
13	14 39.6	53.8
14	29 39.8	52.9
15	44 40.0	·· 52.0
16	59 40.2	51.1
17	74 40.3	50.2
18	89 40.5	+ 9 49.4
19	104 40.7	48.5
20	119 40.9	47.6
21	134 41.1	·· 46.7
22	149 41.2	45.8
23	164 41.4	45.0
24	179 41.6	+ 9 44.1
code	—	− 9

STARS No.	SHA	Dec.	Transit Mer. Gr.
	° ′	° ′	h m
1	358 31.4	+28 49.5	1 48
2	358 20.9	+58 53.0	1 49
3	349 42.1	−18 14.9	2 23
4	339 20.2	+59 59.0	3 04
5	336 00.6	−57 28.5	3 18
6	332 27.5	+89 02.1	3 32
7	328 53.1	+23 14.2	3 46
8	315 53.3	−40 29.4	4 38
9	309 47.0	+49 41.4	5 02
10	291 42.8	+16 25.0	6 14
11	281 56.8	− 8 15.0	6 53
12	281 43.3	+45 57.1	6 54
13	279 22.0	+ 6 18.7	7 04
14	279 11.5	+28 34.2	7 04
15	276 33.6	− 1 13.6	7 15
16	271 51.7	+ 7 24.2	7 34
17	264 17.1	−52 39.7	8 04
18	259 14.9	−16 38.6	8 24
19	255 49.3	−28 54.0	8 38
20	245 48.6	+ 5 21.2	9 18
21	244 24.7	+28 08.8	9 23
22	234 37.8	−59 20.9	10 02
23	223 27.2	−43 14.0	10 47
24	221 51.0	−69 30.9	10 53
25	218 42.1	− 8 26.7	11 06
26	208 33.2	+12 12.4	11 46
27	194 48.9	+62 00.9	12 41
28	183 21.2	+14 50.7	13 27
29	174 02.3	−62 50.1	14 04
30	172 53.5	−56 50.7	14 08
31	168 47.4	−59 25.7	14 25
32	167 01.5	+56 13.5	14 32
33	159 30.4	+55 10.8	15 02
34	159 20.5	−10 54.6	15 02
35	153 35.5	+49 33.4	15 25
36	149 02.8	−36 08.2	15 44
37	146 38.2	+19 26.1	15 53
38	140 55.9	−60 38.6	16 16
39	137 17.7	+74 21.4	16 30
40	126 50.3	+26 52.7	17 12
41	120 37.9	−22 29.3	17 37
42	113 23.3	−26 19.8	18 06
43	109 06.9	−68 56.9	18 23
44	103 05.8	−15 40.1	18 47
45	97 24.9	−37 04.5	19 10
46	96 49.5	+12 35.7	19 12
47	91 07.5	+51 29.8	19 35
48	84 45.2	−34 24.8	20 00
49	81 10.2	+38 44.4	20 14
50	76 55.6	−26 21.6	20 31
51	62 53.3	+ 8 44.4	21 27
52	54 31.7	−56 53.7	22 01
53	50 02.9	+45 06.5	22 18
54	34 32.4	+ 9 39.2	23 20
55	28 41.3	−47 11.7	23 44
56	16 14.7	−29 52.6	0 37
57	14 24.4	+14 56.8	0 45

GCT	Equation of Time (App.—Mean) 26	27	28
h	m s	m s	m s
0	− 2 04.8	− 1 48.2	− 1 31.3
6	− 2 00.7	− 1 44.0	− 1 27.0
12	− 1 56.6	− 1 39.8	− 1 22.7
18	− 1 52.4	− 1 35.5	− 1 18.3
24	− 1 48.2	− 1 31.3	− 1 14.0

Lat.	Sunrise	Twlt. begins	Moonrise 26	27	28	29
N °	h m	h m	h m	h m	h m	h m
70	3 50	////	□	□	□	□
68	4 04	////	□	□	□	23 07
66	4 16	////	□	□	□	24 09
64	4 26	////	□	□	22 33	24 43
62	4 34	////	□	21 27	23 22	25 08
60	4 41	1 16	21 06	22 21	23 53	25 27
58	4 47	1 50	21 45	22 53	24 16	0 16
56	4 53	2 15	22 12	23 17	24 34	0 34
54	4 58	2 33	22 33	23 37	24 50	0 50
52	5 02	2 48	22 51	23 53	25 04	1 04
50	5 06	3 01	23 06	24 07	0 07	1 15
45	5 15	3 26	23 37	24 35	0 35	1 40
40	5 22	3 44	24 00	0 00	0 57	1 59
35	5 28	3 59	24 20	0 20	1 16	2 15
30	5 34	4 09	24 37	0 37	1 32	2 29
20	5 43	4 27	0 14	1 05	1 58	2 53
10	5 51	4 40	0 38	1 29	2 21	3 13
0	5 58	4 49	1 00	1 52	2 43	3 32
10	6 06	4 55	1 23	2 14	3 04	3 51
20	6 13	5 00	1 47	2 39	3 27	4 11
30	6 22	5 03	2 15	3 07	3 53	4 34
35	6 27	5 03	2 32	3 23	4 09	4 48
40	6 32	5 04	2 51	3 43	4 27	5 04
45	6 39	5 02	3 15	4 07	4 49	5 22
50	6 47	5 00	3 46	4 37	5 16	5 46
52	6 50	4 59	4 01	4 52	5 30	5 57
54	6 54	4 58	4 19	5 10	5 45	6 09
56	6 58	4 55	4 41	5 31	6 03	6 24
58	7 03	4 53	5 09	5 58	6 25	6 40
60	7 08	4 51	5 49	6 36	6 54	7 00
S						

Lat.	Sunset	Twlt. ends	Moonset 26	27	28	29
N °	h m	h m	h m	h m	h m	h m
70	20 10	////	□	□	□	□
68	19 56	////	□	□	□	21 23
66	19 45	////	□	□	□	20 20
64	19 36	////	□	□	20 16	19 45
62	19 28	////	□	19 38	19 26	19 20
60	19 21	22 39	18 12	18 43	18 55	19 00
58	19 15	22 07	17 33	18 11	18 32	18 43
56	19 09	21 44	17 06	17 47	18 12	18 29
54	19 04	21 26	16 44	17 27	17 56	18 16
52	19 00	21 12	16 26	17 10	17 43	18 06
50	18 56	20 59	16 11	16 56	17 30	17 56
45	18 48	20 36	15 41	16 27	17 05	17 35
40	18 41	20 18	15 17	16 05	16 45	17 19
35	18 34	20 03	14 57	15 46	16 28	17 05
30	18 29	19 52	14 40	15 30	16 14	16 52
20	18 20	19 35	14 12	15 02	15 49	16 31
10	18 12	19 23	13 48	14 39	15 27	16 13
0	18 05	19 15	13 25	14 16	15 07	15 55
10	17 58	19 09	13 02	13 54	14 47	15 38
20	17 50	19 04	12 38	13 30	14 25	15 19
30	17 42	19 02	12 09	13 03	13 59	14 57
35	17 37	19 01	11 52	12 46	13 44	14 44
40	17 32	19 02	11 33	12 27	13 27	14 30
45	17 25	19 03	11 09	12 03	13 05	14 12
50	17 18	19 06	10 38	11 33	12 39	13 50
52	17 14	19 07	10 23	11 18	12 25	13 39
54	17 10	19 08	10 05	11 01	12 10	13 27
56	17 06	19 10	9 43	10 40	11 52	13 13
58	17 02	19 13	9 15	10 13	11 31	12 57
60	16 56	19 15	8 35	9 35	11 02	12 37
S						

GCT of Transit Meridian of Greenwich

DAY	Moon	Venus	Mars	Jupiter	Saturn
	h m	h m	h m	h m	h m
26	7 13	12 37	10 16	2 38	13 53
27	8 04	12 31	10 14	2 33	13 49
28	8 55	12 25	10 13	2 29	13 46
29	9 44	12 18	10 12	2 25	13 42

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb	Venus	Mars
°	′	′	′
0			
	0.2	0.5	0.1
30			
	0.2	0.4	0.0
45			
	0.2	0.3	0.0
60			
	0.2	0.2	0.0
75			
	0.2	0.1	0.0
90			

Moon's Lower Limb

Add

Alt.	26	27	28
°	′	′	′
0			
	12.0	12.0	12.1
4			
	12.0	12.0	12.1
8			
	12.0	12.0	12.2
12			
	12.1	12.1	12.2
16			
	12.1	12.1	12.2
20			
	12.2	12.2	12.3
24			
	12.3	12.3	12.4
28			
	12.4	12.4	12.5
32			
	12.5	12.5	12.6
36			
	12.6	12.6	12.7
40			
	12.7	12.7	12.8
44			
	12.8	12.8	12.9
48			
	13.0	13.0	13.1
52			
	13.1	13.1	13.2
56			
	13.3	13.3	13.4
60			
	13.5	13.5	13.5
64			
	13.6	13.6	13.7
68			
	13.8	13.8	13.9
72			
	14.0	14.0	14.1
76			
	14.2	14.2	14.3
80			
	14.4	14.4	14.4
84			
	14.6	14.6	14.6
88			
	14.7	14.7	14.8
90			

Add to table, back cover

Moon's Upper Limb

Subtract

Alt.	26	27	28
°	′	′	′
0			
	17.6	17.6	17.5
4			
	17.6	17.6	17.5
8			
	17.5	17.5	17.5
12			
	17.5	17.5	17.4
16			
	17.5	17.5	17.4
20			
	17.4	17.4	17.3
24			
	17.3	17.3	17.2
28			
	17.2	17.2	17.2
32			
	17.1	17.1	17.1
36			
	17.0	17.0	16.9
40			
	16.9	16.9	16.8
44			
	16.7	16.7	16.7
48			
	16.6	16.6	16.6
52			
	16.4	16.4	16.4
56			
	16.3	16.3	16.2
60			
	16.1	16.1	16.1
64			
	15.9	15.9	15.9
68			
	15.7	15.7	15.7
72			
	15.6	15.6	15.6
76			
	15.4	15.4	15.4
80			
	15.2	15.2	15.2
84			
	15.0	15.0	15.0
88			
	14.8	14.8	14.9
90			

Subtract from table, back cover

GCT	♈	VENUS −3.4		MARS 1.9		JUPITER −2.4		SATURN 1.2		MOON			
	GHA	GHA	Dec.	GHA	Dec.	GHA	Dec.	GHA	Dec.	GHA	code	Dec.	code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
0	336 23.6	174 36.2	− 1 10.6	206 56.7	+19 37.3	323 39.0	+ 3 45.9	153 59.6	+ 1 18.5	218 47.9	115	+24 49.5	− 75
1	351 26.1	189 40.0	10.3	221 57.5	36.9	338 41.6	45.8	169 01.8	18.4	233 18.4	116	24 42.0	− 76
2	6 28.6	204 43.9	10.0	236 58.4	36.5	353 44.2	45.8	184 04.0	18.3	247 49.0	116	24 34.4	− 77
3	21 31.0	219 47.7	·· 09.8	251 59.2	·· 36.1	8 46.9	·· 45.7	199 06.2	·· 18.1	262 19.6	117	·24 26.7	− 79
4	36 33.5	234 51.6	09.5	267 00.0	35.7	23 49.5	45.6	214 08.4	18.0	276 50.3	117	24 18.8	− 79
5	51 36.0	249 55.4	09.2	282 00.8	35.3	38 52.2	45.5	229 10.6	17.9	291 21.0	118	24 10.9	− 81
6	66 38.4	264 59.2	− 1 08.9	297 01.6	+19 35.0	53 54.8	+ 3 45.4	244 12.8	+ 1 17.8	305 51.8	118	+24 02.8	− 82
7	81 40.9	280 03.1	08.7	312 02.5	34.6	68 57.5	45.3	259 15.0	17.7	320 22.6	119	23 54.6	− 83
8	96 43.3	295 06.9	08.4	327 03.3	34.2	84 00.1	45.3	274 17.2	17.6	334 53.5	119	23 46.3	− 84
9	111 45.8	310 10.8	·· 08.1	342 04.1	·· 33.8	99 02.7	·· 45.2	289 19.5	·· 17.4	349 24.4	120	·23 37.9	− 85
10	126 48.3	325 14.6	07.8	357 04.9	33.4	114 05.4	45.1	304 21.7	17.3	3 55.4	120	23 29.4	− 86
11	141 50.7	340 18.5	07.5	12 05.7	33.0	129 08.0	45.0	319 23.9	17.2	18 26.4	121	23 20.8	− 87
12	156 53.2	355 22.3	− 1 07.2	27 06.6	+19 32.6	144 10.7	+ 3 44.9	334 26.1	+ 1 17.1	32 57.5	121	+23 12.1	− 89
13	171 55.7	10 26.2	06.9	42 07.4	32.2	159 13.3	44.8	349 28.3	17.0	47 28.6	122	23 03.2	− 89
14	186 58.1	25 30.0	06.6	57 08.2	31.8	174 16.0	44.7	4 30.5	16.9	61 59.8	122	22 54.3	− 91
15	202 00.6	40 33.9	·· 06.3	72 09.0	·· 31.5	189 18.6	·· 44.6	19 32.7	·· 16.7	76 31.0	123	·22 45.2	− 92
16	217 03.1	55 37.8	06.0	87 09.9	31.1	204 21.3	44.6	34 34.9	16.6	91 02.3	124	22 36.0	− 92
17	232 05.5	70 41.6	05.7	102 10.7	30.7	219 23.9	44.5	49 37.1	16.5	105 33.7	123	22 26.8	− 94
18	247 08.0	85 45.5	− 1 05.4	117 11.5	+19 30.3	234 26.6	+ 3 44.4	64 39.3	+ 1 16.4	120 05.0	125	+22 17.4	− 95
19	262 10.5	100 49.3	05.1	132 12.3	29.9	249 29.2	44.3	79 41.5	16.3	134 36.5	125	22 07.9	− 96
20	277 12.9	115 53.2	04.8	147 13.1	29.5	264 31.8	44.2	94 43.7	16.2	149 08.0	125	21 58.3	− 97
21	292 15.4	130 57.0	·· 04.5	162 14.0	·· 29.1	279 34.5	·· 44.1	109 45.9	·· 16.0	163 39.5	126	·21 48.6	− 97
22	307 17.8	146 00.9	04.2	177 14.8	28.7	294 37.1	44.0	124 48.1	15.9	178 11.1	126	21 38.9	− 99
23	322 20.3	161 04.8	03.9	192 15.6	28.3	309 39.8	44.0	139 50.3	15.8	192 42.7	127	21 29.0	−100
0	337 22.8	176 08.6	− 1 03.6	207 16.4	+19 27.9	324 42.4	+ 3 43.9	154 52.5	+ 1 15.7	207 14.4	128	+21 19.0	−101
1	352 25.2	191 12.5	03.3	222 17.3	27.5	339 45.1	43.8	169 54.7	15.6	221 46.2	128	21 08.9	−102
2	7 27.7	206 16.4	02.9	237 18.1	27.1	354 47.7	43.7	184 56.9	15.5	236 18.0	128	20 58.7	−103
3	22 30.2	221 20.3	·· 02.6	252 18.9	·· 26.8	9 50.4	·· 43.6	199 59.1	·· 15.3	250 49.8	129	·20 48.4	−103
4	37 32.6	236 24.1	02.3	267 19.7	26.4	24 53.0	43.5	215 01.3	15.2	265 21.7	130	20 38.1	−105
5	52 35.1	251 28.0	02.0	282 20.6	26.0	39 55.7	43.4	230 03.5	15.1	279 53.7	130	20 27.6	−106
6	67 37.6	266 31.9	− 1 01.7	297 21.4	+19 25.6	54 58.3	+ 3 43.3	245 05.7	+ 1 15.0	294 25.7	130	+20 17.0	−107
7	82 40.0	281 35.8	01.3	312 22.2	25.2	70 01.0	43.3	260 07.9	14.9	308 57.7	131	20 06.3	−107
8	97 42.5	296 39.6	01.0	327 23.0	24.8	85 03.6	43.2	275 10.1	14.8	323 29.8	132	19 55.6	−109
9	112 44.9	311 43.5	·· 00.7	342 23.9	·· 24.4	100 06.3	·· 43.1	290 12.3	·· 14.6	338 02.0	132	·19 44.7	−109
10	127 47.4	326 47.4	00.3	357 24.7	24.0	115 08.9	43.0	305 14.5	14.5	352 34.2	132	19 33.8	−111
11	142 49.9	341 51.3	1 00.0	12 25.5	23.6	130 11.6	42.9	320 16.7	14.4	7 06.4	133	19 22.7	−111
12	157 52.3	356 55.2	− 0 59.7	27 26.3	+19 23.2	145 14.2	+ 3 42.8	335 18.9	+ 1 14.3	21 38.7	133	+19 11.6	−112
13	172 54.8	11 59.0	59.3	42 27.2	22.8	160 16.9	42.7	350 21.1	14.2	36 11.0	134	19 00.4	−113
14	187 57.3	27 02.9	59.0	57 28.0	22.4	175 19.5	42.6	5 23.3	14.1	50 43.4	135	18 49.1	−114
15	202 59.7	42 06.8	·· 58.6	72 28.8	·· 22.0	190 22.2	·· 42.5	20 25.5	·· 13.9	65 15.9	134	·18 37.7	−115
16	218 02.2	57 10.7	58.3	87 29.6	21.6	205 24.8	42.5	35 27.7	13.8	79 48.3	136	18 26.2	−115
17	233 04.7	72 14.6	57.9	102 30.5	21.2	220 27.5	42.4	50 29.9	13.7	94 20.9	136	18 14.7	−117
18	248 07.1	87 18.5	− 0 57.6	117 31.3	+19 20.8	235 30.1	+ 3 42.3	65 32.1	+ 1 13.6	108 53.5	136	+18 03.0	−117
19	263 09.6	102 22.3	57.2	132 32.1	20.4	250 32.8	42.2	80 34.3	13.5	123 26.1	136	17 51.3	−118
20	278 12.1	117 26.2	56.9	147 33.0	20.0	265 35.5	42.1	95 36.5	13.4	137 58.7	138	17 39.5	−120
21	293 14.5	132 30.1	·· 56.5	162 33.8	·· 19.6	280 38.1	·· 42.0	110 38.7	·· 13.2	152 31.5	137	·17 27.5	−119
22	308 17.0	147 34.0	56.2	177 34.6	19.3	295 40.8	41.9	125 40.9	13.1	167 04.2	138	17 15.6	−121
23	323 19.4	162 37.9	55.8	192 35.4	18.9	310 43.4	41.8	140 43.1	13.0	181 37.0	139	17 03.5	−121
0	338 21.9	177 41.8	− 0 55.5	207 36.3	+19 18.5	325 46.1	+ 3 41.7	155 45.3	+ 1 12.9	196 09.9	138	+16 51.4	−123
1	353 24.4	192 45.7	55.1	222 37.1	18.1	340 48.7	41.7	170 47.5	12.8	210 42.7	140	16 39.1	−123
2	8 26.8	207 49.6	54.7	237 37.9	17.7	355 51.4	41.6	185 49.7	12.6	225 15.7	139	16 26.8	−124
3	23 29.3	222 53.5	·· 54.4	252 38.8	·· 17.3	10 54.0	·· 41.5	200 51.9	·· 12.5	239 48.6	140	·16 14.4	−124
4	38 31.8	237 57.4	54.0	267 39.6	16.9	25 56.7	41.4	215 54.1	12.4	254 21.6	141	16 02.0	−125
5	53 34.2	253 01.3	53.6	282 40.4	16.5	40 59.3	41.3	230 56.3	12.3	268 54.7	141	15 49.5	−127
6	68 36.7	268 05.2	− 0 53.3	297 41.2	+19 16.1	56 02.0	+ 3 41.2	245 58.5	+ 1 12.2	283 27.8	141	+15 36.8	−126
7	83 39.2	283 09.1	52.9	312 42.1	15.7	71 04.7	41.1	261 00.7	12.1	298 00.9	142	15 24.2	−128
8	98 41.6	298 13.0	52.5	327 42.9	15.3	86 07.3	41.0	276 02.9	11.9	312 34.1	142	15 11.4	−128
9	113 44.1	313 16.9	·· 52.1	342 43.7	·· 14.9	101 10.0	·· 40.9	291 05.1	·· 11.8	327 07.3	142	·14 58.6	−129
10	128 46.6	328 20.8	51.8	357 44.6	14.5	116 12.6	40.8	306 07.3	11.7	341 40.5	143	14 45.7	−130
11	143 49.0	343 24.7	51.4	12 45.4	14.1	131 15.3	40.7	321 09.5	11.6	356 13.8	143	14 32.7	−130
12	158 51.5	358 28.6	− 0 51.0	27 46.2	+19 13.7	146 17.9	+ 3 40.7	336 11.7	+ 1 11.5	10 47.1	144	+14 19.7	−131
13	173 53.9	13 32.5	50.6	42 47.0	13.3	161 20.6	40.6	351 13.9	11.4	25 20.5	144	14 06.6	−132
14	188 56.4	28 36.4	50.2	57 47.9	12.9	176 23.3	40.5	6 16.1	11.2	39 53.9	144	13 53.4	−132
15	203 58.9	43 40.3	·· 49.8	72 48.7	·· 12.5	191 25.9	·· 40.4	21 18.3	·· 11.1	54 27.3	145	·13 40.2	−134
16	219 01.3	58 44.2	49.4	87 49.5	12.1	206 28.6	40.3	36 20.5	11.0	69 00.8	144	13 26.8	−133
17	234 03.8	73 48.1	49.1	102 50.4	11.7	221 31.2	40.2	51 22.6	10.9	83 34.2	146	13 13.5	−135
18	249 06.3	88 52.0	− 0 48.7	117 51.2	+19 11.3	236 33.9	+ 3 40.1	66 24.8	+ 1 10.8	98 07.8	145	+13 00.0	−135
19	264 08.7	103 55.9	48.3	132 52.0	10.9	251 36.6	40.0	81 27.0	10.6	112 41.3	146	12 46.5	−135
20	279 11.2	118 59.8	47.9	147 52.9	10.5	266 39.2	39.9	96 29.2	10.5	127 14.9	146	12 33.0	−137
21	294 13.7	134 03.7	·· 47.5	162 53.7	·· 10.1	281 41.9	·· 39.8	111 31.4	·· 10.4	141 48.5	146	·12 19.3	−136
22	309 16.1	149 07.6	47.1	177 54.5	09.7	296 44.5	39.7	126 33.6	10.3	156 22.1	147	12 05.7	−138
23	324 18.6	164 11.5	46.7	192 55.4	09.3	311 47.2	39.6	141 35.8	10.2	170 55.8	147	11 51.9	−138
24	339 21.1	179 15.4	− 0 46.3	207 56.2	+19 08.9	326 49.9	+ 3 39.6	156 38.0	+ 1 10.1	185 29.5	147	+11 38.1	−138
code	—	+ 38	+ 4	+ 9	− 4	+ 27	− 1	+ 22	− 1				

GCT h	SUN GHA ° ′	SUN Dec. ° ′
0	179 41.6	+ 9 44.1
1	194 41.8	43.2
2	209 42.0	42.3
3	224 42.2 ··	41.4
4	239 42.3	40.5
5	254 42.5	39.7
6	269 42.7	+ 9 38.8
7	284 42.9	37.9
8	299 43.1	37.0
9	314 43.3 ··	36.1
10	329 43.4	35.2
11	344 43.6	34.3
12	359 43.8	+ 9 33.5
13	14 44.0	32.6
14	29 44.2	31.7
15	44 44.4 ··	30.8
16	59 44.5	29.9
17	74 44.7	29.0
18	89 44.9	+ 9 28.1
19	104 45.1	27.2
20	119 45.3	26.4
21	134 45.5 ··	25.5
22	149 45.7	24.6
23	164 45.8	23.7
0	179 46.0	+ 9 22.8
1	194 46.2	21.9
2	209 46.4	21.0
3	224 46.6 ··	20.1
4	239 46.8	19.2
5	254 47.0	18.3
6	269 47.1	+ 9 17.5
7	284 47.3	16.6
8	299 47.5	15.7
9	314 47.7 ··	14.8
10	329 47.9	13.9
11	344 48.1	13.0
12	359 48.3	+ 9 12.1
13	14 48.5	11.2
14	29 48.6	10.3
15	44 48.8 ··	09.4
16	59 49.0	08.5
17	74 49.2	07.6
18	89 49.4	+ 9 06.7
19	104 49.6	05.9
20	119 49.8	05.0
21	134 50.0 ··	04.1
22	149 50.2	03.2
23	164 50.3	02.3
0	179 50.5	+ 9 01.4
1	194 50.7	9 00.5
2	209 50.9	8 59.6
3	224 51.1 ··	58.7
4	239 51.3	57.8
5	254 51.5	56.9
6	269 51.7	+ 8 56.0
7	284 51.9	55.1
8	299 52.1	54.2
9	314 52.2 ··	53.3
10	329 52.4	52.4
11	344 52.6	51.5
12	359 52.8	+ 8 50.6
13	14 53.0	49.7
14	29 53.2	48.8
15	44 53.4 ··	47.9
16	59 53.6	47.0
17	74 53.8	46.1
18	89 54.0	+ 8 45.2
19	104 54.2	44.3
20	119 54.4	43.4
21	134 54.5 ··	42.5
22	149 54.7	41.6
23	164 54.9	40.7
24	179 55.1	+ 8 39.8
code	—	− 9

STARS No.	SHA ° ′	Dec. ° ′	Transit Mer. Gr. h m
1	358 31.4	+28 49.5	1 36
2	358 20.8	+58 53.0	1 37
3	349 42.1	−18 14.9	2 11
4	339 20.2	+59 59.0	2 53
5	336 00.6	−57 28.5	3 06
6	332 26.6	+89 02.1	3 20
7	328 53.1	+23 14.2	3 34
8	315 53.3	−40 29.4	4 26
9	309 47.0	+49 41.4	4 51
10	291 42.8	+16 25.0	6 03
11	281 56.8	− 8 15.0	6 42
12	281 43.3	+45 57.1	6 42
13	279 21.9	+ 6 18.7	6 52
14	279 11.5	+28 34.2	6 53
15	276 33.6	− 1 13.6	7 03
16	271 51.7	+ 7 24.2	7 22
17	264 17.1	−52 39.7	7 52
18	259 14.9	−16 38.6	8 12
19	255 49.3	−28 53.9	8 26
20	245 48.6	+ 5 21.2	9 06
21	244 24.7	+28 08.8	9 11
22	234 37.8	−59 20.9	9 50
23	223 27.2	−43 14.0	10 35
24	221 51.0	−69 30.9	10 41
25	218 42.1	− 8 26.7	10 54
26	208 33.2	+12 12.4	11 34
27	194 48.9	+62 00.8	12 29
28	183 21.2	+14 50.7	13 15
29	174 02.3	−62 50.0	13 52
30	172 53.5	−56 50.7	13 57
31	168 47.4	−59 25.7	14 13
32	167 01.5	+56 13.5	14 20
33	159 30.4	+55 10.8	14 50
34	159 20.5	−10 54.6	14 51
35	153 35.5	+49 33.4	15 14
36	149 02.8	−36 08.2	15 32
37	146 38.2	+19 26.1	15 41
38	140 55.9	−60 38.6	16 04
39	137 17.7	+74 21.4	16 19
40	126 50.4	+26 52.7	17 00
41	120 37.9	−22 29.3	17 25
42	113 23.3	−26 19.8	17 54
43	109 06.9	−68 56.9	18 11
44	103 05.8	−15 40.1	18 35
45	97 24.9	−37 04.5	18 58
46	96 49.5	+12 35.7	19 00
47	91 07.5	+51 29.8	19 23
48	84 45.2	−34 24.8	19 48
49	81 10.2	+38 44.4	20 03
50	76 55.6	−26 21.7	20 19
51	62 53.3	+ 8 44.4	21 15
52	54 31.7	−56 53.7	21 49
53	50 02.9	+45 06.5	22 07
54	34 32.4	+ 9 39.2	23 09
55	28 41.3	−47 11.7	23 32
56	16 14.7	−29 52.6	0 25
57	14 24.4	+14 56.8	0 33

Lat. °	Sunrise h m	Twlt. begins h m	Moonrise 29 h m	Moonrise 30 h m	Moonrise 31 h m	Moonrise 1 h m
N 70	4 03	////	▭	▭	1 20	3 40
68	4 16	////	23 07	25 52	1 52	3 54
66	4 26	////	24 09	0 09	2 16	4 06
64	4 34	////	24 43	0 43	2 34	4 16
62	4 42	0 49	25 08	1 08	2 48	4 24
60	4 48	1 37	25 27	1 27	3 01	4 31
58	4 54	2 05	0 16	1 43	3 11	4 38
56	4 59	2 26	0 34	1 57	3 21	4 43
54	5 03	2 42	0 50	2 09	3 29	4 48
52	5 07	2 55	1 04	2 19	3 36	4 52
50	5 11	3 07	1 15	2 28	3 42	4 56
45	5 18	3 30	1 40	2 47	3 56	5 05
40	5 25	3 48	1 59	3 03	4 08	5 12
35	5 31	4 01	2 15	3 16	4 17	5 18
30	5 35	4 12	2 29	3 28	4 26	5 24
20	5 44	4 28	2 53	3 47	4 41	5 33
10	5 51	4 40	3 13	4 04	4 53	5 41
0	5 57	4 48	3 32	4 20	5 05	5 49
10	6 04	4 55	3 51	4 35	5 17	5 56
20	6 11	4 58	4 11	4 52	5 29	6 04
30	6 18	5 00	4 34	5 11	5 44	6 13
35	6 23	5 00	4 48	5 22	5 52	6 18
40	6 28	4 59	5 04	5 35	6 01	6 24
45	6 33	4 57	5 22	5 50	6 12	6 31
50	6 40	4 54	5 46	6 08	6 25	6 39
52	6 43	4 53	5 57	6 16	6 31	6 43
54	6 47	4 51	6 09	6 26	6 38	6 47
56	6 50	4 49	6 24	6 36	6 45	6 52
58	6 55	4 46	6 40	6 49	6 54	6 57
S 60	6 59	4 43	7 00	7 03	7 03	7 02

Lat. °	Sunset h m	Twlt. ends h m	Moonset 29 h m	Moonset 30 h m	Moonset 31 h m	Moonset 1 h m
N 70	19 55	////	▭	20 47	20 00	19 29
68	19 43	////	21 23	20 14	19 44	19 21
66	19 33	////	20 20	19 49	19 30	19 15
64	19 25	////	19 45	19 30	19 19	19 09
62	19 18	23 00	19 20	19 14	19 09	19 04
60	19 12	22 18	19 00	19 01	19 01	19 00
58	19 06	21 51	18 43	18 49	18 53	18 56
56	19 02	21 32	18 29	18 39	18 47	18 53
54	18 57	21 15	18 16	18 31	18 41	18 50
52	18 53	21 02	18 06	18 22	18 36	18 47
50	18 50	20 51	17 56	18 15	18 31	18 44
45	18 42	20 28	17 35	18 00	18 21	18 39
40	18 36	20 12	17 19	17 47	18 12	18 34
35	18 30	19 58	17 05	17 36	18 04	18 30
30	18 26	19 49	16 52	17 27	17 58	18 26
20	18 18	19 33	16 31	17 10	17 46	18 20
10	18 11	19 22	16 13	16 55	17 36	18 15
0	18 04	19 14	15 55	16 42	17 26	18 09
10	17 58	19 08	15 38	16 28	17 16	18 04
20	17 51	19 05	15 19	16 13	17 06	17 58
30	17 44	19 04	14 57	15 56	16 54	17 51
35	17 39	19 03	14 44	15 46	16 47	17 48
40	17 34	19 04	14 30	15 34	16 39	17 43
45	17 29	19 07	14 12	15 20	16 29	17 38
50	17 22	19 10	13 50	15 04	16 18	17 32
52	17 19	19 11	13 39	14 56	16 13	17 29
54	17 16	19 14	13 27	14 47	16 07	17 26
56	17 12	19 16	13 13	14 37	16 00	17 22
58	17 08	19 19	12 57	14 26	15 53	17 19
S 60	17 04	19 23	12 37	14 12	15 44	17 14

GCT h	Equation of Time (App.—Mean) 29 m s	30 m s	31 m s
0	− 1 14.0	− 0 56.3	− 0 38.3
6	− 1 09.6	− 0 51.8	− 0 33.7
12	− 1 05.2	− 0 47.3	− 0 29.1
18	− 1 00.7	− 0 42.8	− 0 24.5
24	− 0 56.3	− 0 38.3	− 0 19.9

GCT of Transit Meridian of Greenwich

DAY	Moon h m	Venus h m	Mars h m	Jupiter h m	Saturn h m
29	9 44	12 18	10 12	2 25	13 42
30	10 31	12 12	10 10	2 21	13 39
31	11 16	12 06	10 09	2 17	13 35
1	11 59	12 00	10 08	2 12	13 32

ADDITIONAL ALTITUDE CORRECTIONS

Alt. °	Sun's Low'r Limb ′	Venus ′	Mars ′
0			
	0.2	0.5	0.1
30			
	0.2	0.4	0.0
45			
	0.2	0.3	0.0
60			
	0.2	0.2	0.0
75			
	0.2	0.1	0.0
90			

Moon's Lower Limb
Add

Alt. °	29 ′	30 ′	31 ′
0			
	12.4	12.9	13.4
4			
	12.4	12.9	13.4
8			
	12.4	12.9	13.4
12			
	12.4	12.9	13.4
16			
	12.5	13.0	13.5
20			
	12.6	13.0	13.5
24			
	12.6	13.1	13.6
28			
	12.7	13.2	13.6
32			
	12.8	13.2	13.7
36			
	12.9	13.3	13.7
40			
	13.0	13.4	13.8
44			
	13.1	13.5	13.9
48			
	13.3	13.6	14.0
52			
	13.4	13.7	14.1
56			
	13.5	13.9	14.2
60			
	13.7	14.0	14.3
64			
	13.9	14.1	14.4
68			
	14.0	14.3	14.5
72			
	14.2	14.4	14.6
76			
	14.4	14.5	14.7
80			
	14.5	14.7	14.9
84			
	14.7	14.8	15.0
88			
	14.8	14.9	15.1
90			

Add to table, back cover

Moon's Upper Limb
Subtract

Alt. °	29 ′	30 ′	31 ′
0			
	17.4	17.1	16.8
4			
	17.4	17.1	16.8
8			
	17.3	17.0	16.8
12			
	17.3	17.0	16.7
16			
	17.2	17.0	16.7
20			
	17.2	16.9	16.7
24			
	17.1	16.9	16.6
28			
	17.0	16.8	16.6
32			
	16.9	16.7	16.5
36			
	16.8	16.6	16.4
40			
	16.7	16.5	16.4
44			
	16.6	16.4	16.3
48			
	16.5	16.3	16.2
52			
	16.3	16.2	16.1
56			
	16.2	16.1	16.0
60			
	16.0	16.0	15.9
64			
	15.9	15.8	15.8
68			
	15.7	15.7	15.7
72			
	15.6	15.6	15.6
76			
	15.4	15.4	15.4
80			
	15.2	15.3	15.3
84			
	15.0	15.1	15.2
88			
	14.9	15.0	15.1
90			

Subtract from table, back cover

GCT	♈	VENUS −3.2		MARS 1.9		JUPITER −2.4		SATURN 1.2		MOON			
	GHA	GHA	Dec.	GHA	Dec.	GHA	Dec.	GHA	Dec.	GHA	code	Dec.	code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
0	339 21.1	179 15.4	− 0 46.3	207 56.2	+19 08.9	326 49.9	+ 3 39.6	156 38.0	+ 1 10.1	185 29.5	147	+11 38.1	−138
1	354 23.5	194 19.3	45.9	222 57.0	08.5	341 52.5	39.5	171 40.2	09.9	200 03.2	148	11 24.3	−140
2	9 26.0	209 23.2	45.5	237 57.9	08.1	356 55.2	39.4	186 42.4	09.8	214 37.0	147	11 10.3	−139
3	24 28.4	224 27.1	·· 45.0	252 58.7	·· 07.7	11 57.8	·· 39.3	201 44.6	·· 09.7	229 10.7	148	·10 56.4	−141
4	39 30.9	239 31.1	44.6	267 59.5	07.2	27 00.5	39.2	216 46.8	09.6	243 44.5	149	10 42.3	−141
5	54 33.4	254 35.0	44.2	283 00.4	06.8	42 03.2	39.1	231 49.0	09.5	258 18.4	148	10 28.2	−141
6	69 35.8	269 38.9	− 0 43.8	298 01.2	+19 06.4	57 05.8	+ 3 39.0	246 51.2	+ 1 09.4	272 52.2	149	+10 14.1	−142
7	84 38.3	284 42.8	43.4	313 02.0	06.0	72 08.5	38.9	261 53.4	09.2	287 26.1	148	9 59.9	−142
8	99 40.8	299 46.7	43.0	328 02.9	05.6	87 11.1	38.8	276 55.6	09.1	301 59.9	150	9 45.7	−143
9	114 43.2	314 50.6	·· 42.6	343 03.7	·· 05.2	102 13.8	·· 38.7	291 57.8	·· 09.0	316 33.9	149	+ 9 31.4	−143
10	129 45.7	329 54.5	42.1	358 04.5	04.8	117 16.5	38.6	307 00.0	08.9				
11	144 48.2	344 58.4	41.7	13 05.4	04.4	132 19.1	38.5	322 02.2	08.8	Sun partially eclipsed,			
12	159 50.6	0 02.4	− 0 41.3	28 06.2	+19 04.0	147 21.8	+ 3 38.4	337 04.4	+ 1 08.6	Atlantic—annular path			
13	174 53.1	15 06.3	40.9	43 07.0	03.6	162 24.5	38.3	352 06.6	08.5	Virginia to Madagascar			
14	189 55.5	30 10.2	40.4	58 07.9	03.2	177 27.1	38.2	7 08.8	08.4				
15	204 58.0	45 14.1	·· 40.0	73 08.7	·· 02.8	192 29.8	·· 38.2	22 11.0	·· 08.3				
16	220 00.5	60 18.0	39.6	88 09.6	02.4	207 32.5	38.1	37 13.2	08.2	58 31.6	151	+ 7 50.0	−146
17	235 02.9	75 21.9	39.1	103 10.4	02.0	222 35.1	38.0	52 15.4	08.1	73 05.7	150	7 35.4	−147
18	250 05.4	90 25.8	− 0 38.7	118 11.2	+19 01.6	237 37.8	+ 3 37.9	67 17.6	+ 1 07.9	87 39.7	151	+ 7 20.7	−147
19	265 07.9	105 29.8	38.3	133 12.1	01.2	252 40.5	37.8	82 19.8	07.8	102 13.8	150	7 06.0	−148
20	280 10.3	120 33.7	37.8	148 12.9	00.8	267 43.1	37.7	97 22.0	07.7	116 47.8	151	6 51.2	−148
21	295 12.8	135 37.6	·· 37.4	163 13.7	·· 00.4	282 45.8	·· 37.6	112 24.2	·· 07.6	131 21.9	151	· 6 36.4	−149
22	310 15.3	150 41.5	37.0	178 14.6	19 00.0	297 48.5	37.5	127 26.4	07.5	145 56.0	150	6 21.5	−149
23	325 17.7	165 45.4	36.5	193 15.4	18 59.5	312 51.1	37.4	142 28.6	07.3	160 30.0	151	6 06.6	−149
0	340 20.2	180 49.3	− 0 36.1	208 16.2	+18 59.1	327 53.8	+ 3 37.3	157 30.8	+ 1 07.2	175 04.1	151	+ 5 51.7	−150
1	355 22.7	195 53.2	35.6	223 17.1	58.7	342 56.5	37.2	172 33.0	07.1	189 38.2	151	5 36.7	−150
2	10 25.1	210 57.2	35.2	238 17.9	58.3	357 59.1	37.1	187 35.2	07.0	204 12.3	151	5 21.7	−150
3	25 27.6	226 01.1	·· 34.7	253 18.8	·· 57.9	13 01.8	·· 37.0	202 37.4	·· 06.9	218 46.4	151	· 5 06.7	−151
4	40 30.0	241 05.0	34.3	268 19.6	57.5	28 04.5	36.9	217 39.6	06.8	233 20.5	151	4 51.6	−151
5	55 32.5	256 08.9	33.8	283 20.4	57.1	43 07.1	36.8	232 41.8	06.6	247 54.6	151	4 36.5	−151
6	70 35.0	271 12.8	− 0 33.4	298 21.3	+18 56.7	58 09.8	+ 3 36.7	247 44.0	+ 1 06.5	262 28.7	151	+ 4 21.4	−151
7	85 37.4	286 16.7	32.9	313 22.1	56.3	73 12.5	36.6	262 46.2	06.4	277 02.8	151	4 06.3	−152
8	100 39.9	301 20.7	32.4	328 23.0	55.9	88 15.1	36.5	277 48.4	06.3	291 36.9	151	3 51.1	−152
9	115 42.4	316 24.6	·· 32.0	343 23.8	·· 55.5	103 17.8	·· 36.4	292 50.5	·· 06.2	306 11.0	151	· 3 35.9	−152
10	130 44.8	331 28.5	31.5	358 24.6	55.1	118 20.5	36.3	307 52.7	06.0	320 45.1	151	3 20.7	−153
11	145 47.3	346 32.4	31.1	13 25.5	54.6	133 23.1	36.3	322 54.9	05.9	335 19.2	150	3 05.4	−153
12	160 49.8	1 36.3	− 0 30.6	28 26.3	+18 54.2	148 25.8	+ 3 36.2	337 57.1	+ 1 05.8	349 53.2	151	+ 2 50.1	−153
13	175 52.2	16 40.2	30.1	43 27.2	53.8	163 28.5	36.1	352 59.3	05.7	4 27.3	151	2 34.8	−153
14	190 54.7	31 44.2	29.7	58 28.0	53.4	178 31.2	36.0	8 01.5	05.6	19 01.4	150	2 19.5	−153
15	205 57.1	46 48.1	·· 29.2	73 28.8	·· 53.0	193 33.8	·· 35.9	23 03.7	·· 05.5	33 35.4	151	· 2 04.2	−154
16	220 59.6	61 52.0	28.7	88 29.7	52.6	208 36.5	35.8	38 05.9	05.3	48 09.5	150	1 48.8	−154
17	236 02.1	76 55.9	28.3	103 30.5	52.2	223 39.2	35.7	53 08.1	05.2	62 43.5	150	1 33.4	−154
18	251 04.5	91 59.8	− 0 27.8	118 31.4	+18 51.8	238 41.8	+ 3 35.6	68 10.3	+ 1 05.1	77 17.5	150	+ 1 18.0	−154
19	266 07.0	107 03.7	27.3	133 32.2	51.4	253 44.5	35.5	83 12.5	05.0	91 51.5	150	1 02.6	−154
20	281 09.5	122 07.6	26.8	148 33.0	50.9	268 47.2	35.4	98 14.7	04.9	106 25.5	149	0 47.2	−155
21	296 11.9	137 11.6	·· 26.4	163 33.9	·· 50.5	283 49.9	·· 35.3	113 16.9	·· 04.7	120 59.4	150	· 0 31.7	−154
22	311 14.4	152 15.5	25.9	178 34.7	50.1	298 52.5	35.2	128 19.1	04.6	135 33.4	149	0 16.3	−155
23	326 16.9	167 19.4	25.4	193 35.6	49.7	313 55.2	35.1	143 21.3	04.5	150 07.3	149	+ 0 00.8	−155
0	341 19.3	182 23.3	− 0 24.9	208 36.4	+18 49.3	328 57.9	+ 3 35.0	158 23.5	+ 1 04.4	164 41.2	149	− 0 14.7	−155
1	356 21.8	197 27.2	24.4	223 37.3	48.9	344 00.5	34.9	173 25.7	04.3	179 15.1	149	0 30.2	−155
2	11 24.3	212 31.1	23.9	238 38.1	48.5	359 03.2	34.8	188 27.9	04.2	193 49.0	148	0 45.7	−155
3	26 26.7	227 35.1	·· 23.5	253 38.9	·· 48.1	14 05.9	·· 34.7	203 30.1	·· 04.0	208 22.8	148	· 1 01.2	−155
4	41 29.2	242 39.0	23.0	268 39.8	47.6	29 08.6	34.6	218 32.3	03.9	222 56.6	148	1 16.7	−155
5	56 31.6	257 42.9	22.5	283 40.6	47.2	44 11.2	34.5	233 34.5	03.8	237 30.4	148	1 32.2	−155
6	71 34.1	272 46.8	− 0 22.0	298 41.5	+18 46.8	59 13.9	+ 3 34.4	248 36.7	+ 1 03.7	252 04.2	147	− 1 47.7	−155
7	86 36.6	287 50.7	21.5	313 42.3	46.4	74 16.6	34.3	263 38.9	03.6	266 37.9	147	2 03.2	−156
8	101 39.0	302 54.6	21.0	328 43.2	46.0	89 19.3	34.2	278 41.1	03.4	281 11.6	147	2 18.8	−155
9	116 41.5	317 58.5	·· 20.5	343 44.0	·· 45.6	104 21.9	·· 34.1	293 43.3	·· 03.3	295 45.3	146	· 2 34.3	−155
10	131 44.0	333 02.4	20.0	358 44.8	45.2	119 24.6	34.0	308 45.4	03.2	310 18.9	147	2 49.8	−155
11	146 46.4	348 06.4	19.5	13 45.7	44.7	134 27.3	33.9	323 47.6	03.1	324 52.6	145	3 05.3	−156
12	161 48.9	3 10.3	− 0 19.0	28 46.5	+18 44.3	149 30.0	+ 3 33.8	338 49.8	+ 1 03.0	339 26.1	146	− 3 20.9	−155
13	176 51.4	18 14.2	18.5	43 47.4	43.9	164 32.6	33.7	353 52.0	02.8	353 59.7	145	3 36.4	−155
14	191 53.8	33 18.1	18.0	58 48.2	43.5	179 35.3	33.6	8 54.2	02.7	8 33.2	145	3 51.9	−155
15	206 56.3	48 22.0	·· 17.5	73 49.1	·· 43.1	194 38.0	·· 33.5	23 56.4	·· 02.6	23 06.7	144	· 4 07.4	−155
16	221 58.7	63 25.9	17.0	88 49.9	42.7	209 40.7	33.4	38 58.6	02.5	37 40.1	144	4 22.9	−155
17	237 01.2	78 29.8	16.5	103 50.8	42.3	224 43.4	33.3	54 00.8	02.4	52 13.5	143	4 38.4	−155
18	252 03.7	93 33.7	− 0 16.0	118 51.6	+18 41.8	239 46.0	+ 3 33.2	69 03.0	+ 1 02.3	66 46.8	144	− 4 53.9	−155
19	267 06.1	108 37.6	15.5	133 52.4	41.4	254 48.7	33.1	84 05.2	02.1	81 20.2	142	5 09.4	−154
20	282 08.6	123 41.5	14.9	148 53.3	41.0	269 51.4	33.0	99 07.4	02.0	95 53.4	142	5 24.8	−155
21	297 11.1	138 45.4	·· 14.4	163 54.1	·· 40.6	284 54.1	·· 32.9	114 09.6	·· 01.9	110 26.6	142	· 5 40.3	−154
22	312 13.5	153 49.3	13.9	178 55.0	40.2	299 56.7	32.8	129 11.8	01.8	124 59.8	141	5 55.7	−154
23	327 16.0	168 53.2	13.4	193 55.8	39.8	314 59.4	32.7	144 14.0	01.7	139 32.9	141	6 11.1	−154
24	342 18.5	183 57.1	− 0 12.9	208 56.7	+18 39.3	330 02.1	+ 3 32.6	159 16.2	+ 1 01.5	154 06.0	141	− 6 26.5	−154
code	−	+ 39	+ 5	+ 9	− 4	+ 27	− 1	+ 22	− 1				

GCT (h)	SUN GHA (° ′)	SUN Dec. (° ′)
0	179 55.1	+ 8 39.8
1	194 55.3	38.9
2	209 55.5	38.0
3	224 55.7 ··	37.1
4	239 55.9	36.2
5	254 56.1	35.3
6	269 56.3	+ 8 34.4
7	284 56.5	33.5
8	299 56.7	32.6
9	314 56.9 ··	31.7
10	329 57.1	30.8
11	344 57.2	29.9
12	359 57.4	+ 8 29.0
13	14 57.6	28.1
14	29 57.8	27.2
15	44 58.0 ··	26.3
16	59 58.2	25.4
17	74 58.4	24.5
18	89 58.6	+ 8 23.5
19	104 58.8	22.6
20	119 59.0	21.7
21	134 59.2 ··	20.8
22	149 59.4	19.9
23	164 59.6	19.0
0	179 59.8	+ 8 18.1
1	195 00.0	17.2
2	210 00.2	16.3
3	225 00.4 ··	15.4
4	240 00.6	14.5
5	255 00.8	13.6
6	270 01.0	+ 8 12.7
7	285 01.2	11.7
8	300 01.4	10.8
9	315 01.6 ··	09.9
10	330 01.8	09.0
11	345 02.0	08.1
12	0 02.2	+ 8 07.2
13	15 02.3	06.3
14	30 02.5	05.4
15	45 02.7 ··	04.5
16	60 02.9	03.6
17	75 03.1	02.6
18	90 03.3	+ 8 01.7
19	105 03.5	8 00.8
20	120 03.7	7 59.9
21	135 03.9 ··	59.0
22	150 04.1	58.1
23	165 04.3	57.2
0	180 04.5	+ 7 56.3
1	195 04.7	55.4
2	210 04.9	54.4
3	225 05.1 ··	53.5
4	240 05.3	52.6
5	255 05.5	51.7
6	270 05.7	+ 7 50.8
7	285 05.9	49.9
8	300 06.1	49.0
9	315 06.3 ··	48.0
10	330 06.5	47.1
11	345 06.7	46.2
12	0 06.9	+ 7 45.3
13	15 07.1	44.4
14	30 07.3	43.5
15	45 07.5 ··	42.6
16	60 07.7	41.6
17	75 07.9	40.7
18	90 08.1	+ 7 39.8
19	105 08.3	38.9
20	120 08.5	38.0
21	135 08.7 ··	37.1
22	150 08.9	36.1
23	165 09.1	35.2
24	180 09.3	+ 7 34.3
code	—	− 9

STARS No.	SHA (° ′)	Dec. (° ′)	Transit Mer. Gr. (h m)
1	358 31.4	+28 49.5	1 24
2	358 20.8	+58 53.0	1 25
3	349 42.1	−18 14.9	2 00
4	339 20.1	+59 59.1	2 41
5	336 00.6	−57 28.5	2 54
6	332 25.8	+89 02.1	3 08
7	328 53.1	+23 14.2	3 23
8	315 53.3	−40 29.4	4 14
9	309 46.9	+49 41.4	4 39
10	291 42.7	+16 25.0	5 51
11	281 56.8	− 8 15.0	6 30
12	281 43.3	+45 57.1	6 31
13	279 21.9	+ 6 18.7	6 40
14	279 11.5	+28 34.2	6 41
15	276 33.6	− 1 13.6	6 51
16	271 51.7	+ 7 24.2	7 10
17	264 17.1	−52 39.7	7 40
18	259 14.8	−16 38.6	8 00
19	255 49.3	−28 53.9	8 14
20	245 48.5	+ 5 21.2	8 54
21	244 24.7	+28 08.8	9 00
22	234 37.8	−59 20.9	9 39
23	223 27.2	−43 14.0	10 23
24	221 50.9	−69 30.9	10 30
25	218 42.1	− 8 26.7	10 42
26	208 33.2	+12 12.4	11 23
27	194 48.9	+62 00.8	12 17
28	183 21.2	+14 50.7	13 03
29	174 02.3	−62 50.0	13 40
30	172 53.6	−56 50.7	13 45
31	168 47.4	−59 25.6	14 01
32	167 01.5	+56 13.5	14 08
33	159 30.4	+55 10.8	14 38
34	159 20.5	−10 54.6	14 39
35	153 35.5	+49 33.4	15 02
36	149 02.8	−36 08.1	15 20
37	146 38.2	+19 26.1	15 30
38	140 55.9	−60 38.6	15 52
39	137 17.8	+74 21.4	16 07
40	126 50.4	+26 52.7	16 49
41	120 37.9	−22 29.3	17 13
42	113 23.3	−26 19.8	17 42
43	109 07.0	−68 56.9	17 59
44	103 05.8	−15 40.1	18 23
45	97 24.9	−37 04.5	18 46
46	96 49.5	+12 35.7	18 48
47	91 07.5	+51 29.8	19 11
48	84 45.2	−34 24.8	19 36
49	81 10.2	+38 44.4	19 51
50	76 55.6	−26 21.7	20 08
51	62 53.3	+ 8 44.4	21 04
52	54 31.7	−56 53.7	21 37
53	50 02.9	+45 06.5	21 55
54	34 32.4	+ 9 39.2	22 57
55	28 41.3	−47 11.7	23 20
56	16 14.7	−29 52.6	0 14
57	14 24.3	+14 56.8	0 21

Lat. (°)	Sunrise (h m)	Twlt. begins (h m)	Moonrise 1 (h m)	2 (h m)	3 (h m)	4 (h m)
N 70	4 16	////	3 40	5 42	7 41	9 45
68	4 27	////	3 54	5 47	7 38	9 33
66	4 36	////	4 06	5 51	7 36	9 24
64	4 43	////	4 16	5 55	7 34	9 16
62	4 50	1 19	4 24	5 58	7 32	9 09
60	4 55	1 54	4 31	6 01	7 30	9 03
58	5 00	2 17	4 38	6 03	7 29	8 58
56	5 05	2 36	4 43	6 05	7 28	8 53
54	5 09	2 51	4 48	6 07	7 27	8 49
52	5 12	3 03	4 52	6 09	7 26	8 45
50	5 15	3 14	4 56	6 11	7 25	8 42
45	5 22	3 35	5 05	6 14	7 24	8 35
40	5 28	3 52	5 12	6 17	7 22	8 29
35	5 33	4 04	5 18	6 19	7 21	8 24
30	5 37	4 14	5 24	6 21	7 20	8 19
20	5 44	4 29	5 33	6 25	7 18	8 12
10	5 51	4 40	5 41	6 28	7 16	8 05
0	5 57	4 48	5 49	6 32	7 14	7 59
10	6 02	4 53	5 56	6 35	7 13	7 52
20	6 08	4 56	6 04	6 38	7 11	7 46
30	6 15	4 56	6 13	6 42	7 10	7 39
35	6 19	4 56	6 18	6 44	7 08	7 34
40	6 23	4 55	6 24	6 46	7 07	7 30
45	6 28	4 52	6 31	6 49	7 06	7 24
50	6 34	4 48	6 39	6 52	7 05	7 18
52	6 36	4 47	6 43	6 54	7 04	7 15
54	6 39	4 44	6 47	6 55	7 03	7 11
56	6 43	4 41	6 52	6 57	7 02	7 08
58	6 46	4 38	6 57	6 59	7 01	7 04
S 60	6 50	4 34	7 02	7 01	7 00	6 59

Lat. (°)	Sunset (h m)	Twlt. ends (h m)	Moonset 1 (h m)	2 (h m)	3 (h m)	4 (h m)
N 70	19 41	////	19 29	19 03	18 36	18 06
68	19 30	////	19 21	19 02	18 42	18 20
66	19 22	////	19 15	19 01	18 47	18 31
64	19 15	23 39	19 09	19 00	18 51	18 41
62	19 08	22 31	19 04	18 59	18 55	18 49
60	19 03	22 00	19 00	18 59	18 58	18 57
58	18 58	21 37	18 56	18 58	19 00	19 03
56	18 54	21 19	18 53	18 58	19 03	19 09
54	18 50	21 05	18 50	18 57	19 05	19 14
52	18 47	20 53	18 47	18 57	19 07	19 19
50	18 44	20 43	18 44	18 57	19 09	19 23
45	18 37	20 22	18 39	18 56	19 13	19 32
40	18 31	20 06	18 34	18 55	19 17	19 40
35	18 26	19 54	18 30	18 55	19 20	19 47
30	18 22	19 44	18 26	18 54	19 23	19 53
20	18 15	19 30	18 20	18 53	19 27	20 03
10	18 09	19 20	18 15	18 53	19 31	20 12
0	18 03	19 12	18 09	18 52	19 35	20 20
10	17 58	19 08	18 04	18 51	19 39	20 29
20	17 52	19 05	17 58	18 50	19 43	20 38
30	17 45	19 05	17 51	18 49	19 48	20 49
35	17 42	19 06	17 48	18 49	19 51	20 55
40	17 37	19 07	17 43	18 48	19 54	21 02
45	17 33	19 11	17 38	18 47	19 57	21 10
50	17 27	19 15	17 32	18 46	20 02	21 20
52	17 24	19 16	17 29	18 46	20 04	21 24
54	17 21	19 19	17 26	18 45	20 06	21 29
56	17 18	19 22	17 22	18 45	20 08	21 35
58	17 15	19 26	17 19	18 44	20 11	21 41
S 60	17 11	19 30	17 14	18 43	20 14	21 48

Equation of Time (App.—Mean)

GCT (h)	1 (m s)	2 (m s)	3 (m s)
0	− 0 19.9	− 0 01.2	+ 0 17.7
6	− 0 15.3	+ 0 03.5	+ 0 22.5
12	− 0 10.6	+ 0 08.2	+ 0 27.3
18	− 0 05.9	+ 0 13.0	+ 0 32.1
24	− 0 01.2	+ 0 17.7	+ 0 37.0

GCT of Transit Meridian of Greenwich

DAY	Moon (h m)	Venus (h m)	Mars (h m)	Jupiter (h m)	Saturn (h m)
1	11 59	12 00	10 08	2 12	13 32
2	12 42	11 54	10 06	2 08	13 28
3	13 25	11 47	10 05	2 04	13 25
4	14 09	11 41	10 04	2 00	13 21

ADDITIONAL ALTITUDE CORRECTIONS

Alt. (°)	Sun's Low'r Limb (′)	Venus (′)	Mars (′)
0			
30	0.2	0.5	0.1
45	0.2	0.4	0.0
60	0.2	0.3	0.0
75	0.2	0.2	0.0
90	0.2	0.1	0.0

Moon's Lower Limb

Add

Alt. (°)	1 (′)	2 (′)	3 (′)
0			
4	14.0	14.7	15.3
8	14.0	14.7	15.3
12	14.0	14.7	15.3
16	14.1	14.7	15.3
20	14.1	14.7	15.3
24	14.1	14.7	15.3
28	14.1	14.7	15.3
32	14.2	14.8	15.3
36	14.2	14.8	15.3
40	14.3	14.8	15.3
44	14.3	14.8	15.3
48	14.4	14.9	15.4
52	14.5	14.9	15.4
56	14.5	14.9	15.4
60	14.6	15.0	15.4
64	14.7	15.0	15.4
68	14.7	15.1	15.4
72	14.8	15.1	15.4
76	14.9	15.2	15.4
80	15.0	15.2	15.5
84	15.1	15.3	15.5
88	15.1	15.3	15.5
90	15.2	15.3	15.5

Add to table, back cover

Moon's Upper Limb

Subtract

Alt. (°)	1 (′)	2 (′)	3 (′)
0			
4	16.4	16.1	15.7
8	16.4	16.1	15.7
12	16.4	16.0	15.7
16	16.4	16.0	15.7
20	16.4	16.0	15.7
24	16.3	16.0	15.7
28	16.3	16.0	15.7
32	16.3	16.0	15.7
36	16.2	15.9	15.7
40	16.2	15.9	15.7
44	16.1	15.9	15.6
48	16.1	15.8	15.6
52	16.0	15.8	15.6
56	15.9	15.8	15.6
60	15.9	15.7	15.6
64	15.8	15.7	15.6
68	15.7	15.6	15.6
72	15.6	15.6	15.6
76	15.6	15.6	15.6
80	15.5	15.5	15.5
84	15.4	15.5	15.5
88	15.3	15.4	15.5
90	15.2	15.4	15.5

Subtract from table, back cover

New Moon 1
Labor Day 3

GCT	♈ GHA	VENUS −3.2 GHA	VENUS Dec.	MARS 1.9 GHA	MARS Dec.	JUPITER −2.4 GHA	JUPITER Dec.	SATURN 1.2 GHA	SATURN Dec.	MOON GHA	code	Dec.	code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
0	342 18.5	183 57.1	− 0 12.9	208 56.7	+18 39.3	330 02.1	+ 3 32.6	159 16.2	+ 1 01.5	154 06.0	141	− 6 26.5	−154
1	357 20.9	199 01.0	12.4	223 57.5	38.9	345 04.8	32.5	174 18.4	01.4	168 39.1	140	6 41.9	−154
2	12 23.4	214 04.9	11.8	238 58.4	38.5	0 07.5	32.4	189 20.6	01.3	183 12.1	139	6 57.3	−153
3	27 25.9	229 08.8	·· 11.3	253 59.2	·· 38.1	15 10.1	·· 32.3	204 22.8	·· 01.2	197 45.0	139	· 7 12.6	−154
4	42 28.3	244 12.8	10.8	269 00.1	37.7	30 12.8	32.2	219 25.0	01.1	212 17.9	138	7 28.0	−153
5	57 30.8	259 16.7	10.3	284 00.9	37.2	45 15.5	32.1	234 27.1	00.9	226 50.7	138	7 43.3	−152
6	72 33.2	274 20.6	− 0 09.8	299 01.8	+18 36.8	60 18.2	+ 3 32.0	249 29.3	+ 1 00.8	241 23.5	137	− 7 58.5	−153
7	87 35.7	289 24.5	09.2	314 02.6	36.4	75 20.9	31.9	264 31.5	00.7	255 56.2	136	8 13.8	−152
8	102 38.2	304 28.4	08.7	329 03.5	36.0	90 23.5	31.8	279 33.7	00.6	270 28.8	136	8 29.0	−152
9	117 40.6	319 32.3	·· 08.2	344 04.3	·· 35.6	105 26.2	·· 31.7	294 35.9	·· 00.5	285 01.4	136	· 8 44.2	−152
10	132 43.1	334 36.2	07.6	359 05.2	35.2	120 28.9	31.6	309 38.1	00.3	299 34.0	135	8 59.4	−151
11	147 45.6	349 40.0	07.1	14 06.0	34.7	135 31.6	31.5	324 40.3	00.2	314 06.5	134	9 14.5	−151
12	162 48.0	4 43.9	− 0 06.6	29 06.9	+18 34.3	150 34.3	+ 3 31.4	339 42.5	+ 1 00.1	328 38.9	133	− 9 29.6	−151
13	177 50.5	19 47.8	06.0	44 07.7	33.9	165 37.0	31.3	354 44.7	1 00.0	343 11.2	133	9 44.7	−150
14	192 53.0	34 51.7	05.5	59 08.6	33.5	180 39.6	31.2	9 46.9	0 59.9	357 43.5	132	9 59.7	−150
15	207 55.4	49 55.6	·· 05.0	74 09.4	·· 33.1	195 42.3	·· 31.1	24 49.1	·· 59.8	12 15.7	132	·10 14.7	−150
16	222 57.9	64 59.5	04.4	89 10.3	32.6	210 45.0	31.0	39 51.3	59.6	26 47.9	131	10 29.7	−149
17	238 00.4	80 03.4	03.9	104 11.1	32.2	225 47.7	30.9	54 53.5	59.5	41 20.0	130	10 44.6	−149
18	253 02.8	95 07.3	− 0 03.3	119 12.0	+18 31.8	240 50.4	+ 3 30.8	69 55.7	+ 0 59.4	55 52.0	130	−10 59.5	−148
19	268 05.3	110 11.2	02.8	134 12.8	31.4	255 53.0	30.7	84 57.9	59.3	70 24.0	128	11 14.3	−148
20	283 07.7	125 15.1	02.3	149 13.7	31.0	270 55.7	30.6	100 00.1	59.2	84 55.8	128	11 29.1	−148
21	298 10.2	140 19.0	·· 01.7	164 14.5	·· 30.5	285 58.4	·· 30.5	115 02.3	·· 59.0	99 27.6	128	·11 43.9	−147
22	313 12.7	155 22.8	01.2	179 15.4	30.1	301 01.1	30.4	130 04.4	58.9	113 59.4	126	11 58.6	−147
23	328 15.1	170 26.7	00.6	194 16.2	29.7	316 03.8	30.3	145 06.6	58.8	128 31.0	126	12 13.3	−146
0	343 17.6	185 30.6	− 0 00.1	209 17.1	+18 29.3	331 06.5	+ 3 30.2	160 08.8	+ 0 58.7	143 02.6	125	−12 27.9	−145
1	358 20.1	200 34.5	+ 0 00.5	224 17.9	28.8	346 09.2	30.1	175 11.0	58.6	157 34.1	125	12 42.4	−145
2	13 22.5	215 38.4	01.0	239 18.8	28.4	1 11.8	30.0	190 13.2	58.4	172 05.6	123	12 56.9	−145
3	28 25.0	230 42.3	·· 01.6	254 19.6	·· 28.0	16 14.5	·· 29.9	205 15.4	·· 58.3	186 36.9	123	·13 11.4	−144
4	43 27.5	245 46.1	02.1	269 20.5	27.6	31 17.2	29.8	220 17.6	58.2	201 08.2	122	13 25.8	−144
5	58 29.9	260 50.0	02.7	284 21.3	27.2	46 19.9	29.7	235 19.8	58.1	215 39.4	121	13 40.2	−143
6	73 32.4	275 53.9	+ 0 03.3	299 22.2	+18 26.7	61 22.6	+ 3 29.6	250 22.0	+ 0 58.0	230 10.5	120	−13 54.5	−142
7	88 34.8	290 57.8	03.8	314 23.0	26.3	76 25.3	29.5	265 24.2	57.8	244 41.5	119	14 08.7	−142
8	103 37.3	306 01.7	04.4	329 23.9	25.9	91 28.0	29.4	280 26.4	57.7	259 12.4	119	14 22.9	−141
9	118 39.8	321 05.5	·· 04.9	344 24.7	·· 25.5	106 30.6	·· 29.3	295 28.6	·· 57.6	273 43.3	117	·14 37.0	−140
10	133 42.2	336 09.4	05.5	359 25.6	25.0	121 33.3	29.2	310 30.8	57.5	288 14.0	117	14 51.0	−140
11	148 44.7	351 13.3	06.1	14 26.4	24.6	136 36.0	29.1	325 33.0	57.4	302 44.7	116	15 05.0	−140
12	163 47.2	6 17.1	+ 0 06.6	29 27.3	+18 24.2	151 38.7	+ 3 29.0	340 35.2	+ 0 57.3	317 15.3	115	−15 19.0	−138
13	178 49.6	21 21.0	07.2	44 28.2	23.8	166 41.4	28.9	355 37.3	57.1	331 45.8	114	15 32.8	−138
14	193 52.1	36 24.9	07.8	59 29.0	23.3	181 44.1	28.8	10 39.5	57.0	346 16.2	113	15 46.6	−137
15	208 54.6	51 28.8	·· 08.3	74 29.9	·· 22.9	196 46.8	·· 28.7	25 41.7	·· 56.9	0 46.5	113	·16 00.3	−137
16	223 57.0	66 32.6	08.9	89 30.7	22.5	211 49.5	28.6	40 43.9	56.8	15 16.8	111	16 14.0	−135
17	238 59.5	81 36.5	09.5	104 31.6	22.1	226 52.2	28.5	55 46.1	56.7	29 46.9	110	16 27.5	−135
18	254 02.0	96 40.3	+ 0 10.0	119 32.4	+18 21.6	241 54.8	+ 3 28.4	70 48.3	+ 0 56.5	44 16.9	110	−16 41.0	−135
19	269 04.4	111 44.2	10.6	134 33.3	21.2	256 57.5	28.3	85 50.5	56.4	58 46.9	108	16 54.5	−133
20	284 06.9	126 48.1	11.2	149 34.1	20.8	272 00.2	28.2	100 52.7	56.3	73 16.7	108	17 07.8	−133
21	299 09.3	141 51.9	·· 11.7	164 35.0	·· 20.4	287 02.9	·· 28.1	115 54.9	·· 56.2	87 46.5	106	·17 21.1	−131
22	314 11.8	156 55.8	12.3	179 35.9	19.9	302 05.6	28.0	130 57.1	56.1	102 16.1	106	17 34.2	−131
23	329 14.3	171 59.6	12.9	194 36.7	19.5	317 08.3	27.9	145 59.3	55.9	116 45.7	104	17 47.3	−131
0	344 16.7	187 03.5	+ 0 13.5	209 37.6	+18 19.1	332 11.0	+ 3 27.8	161 01.5	+ 0 55.8	131 15.1	104	−18 00.4	−129
1	359 19.2	202 07.4	14.0	224 38.4	18.6	347 13.7	27.6	176 03.7	55.7	145 44.5	102	18 13.3	−128
2	14 21.7	217 11.2	14.6	239 39.3	18.2	2 16.4	27.5	191 05.9	55.6	160 13.7	102	18 26.1	−128
3	29 24.1	232 15.1	·· 15.2	254 40.1	·· 17.8	17 19.1	·· 27.4	206 08.0	·· 55.5	174 42.9	100	·18 38.9	−126
4	44 26.6	247 18.9	15.8	269 41.0	17.4	32 21.7	27.3	221 10.2	55.3	189 11.9	100	18 51.5	−126
5	59 29.1	262 22.8	16.4	284 41.8	16.9	47 24.4	27.2	236 12.4	55.2	203 40.9	98	19 04.1	−125
6	74 31.5	277 26.6	+ 0 17.0	299 42.7	+18 16.5	62 27.1	+ 3 27.1	251 14.6	+ 0 55.1	218 09.7	97	−19 16.6	−123
7	89 34.0	292 30.5	17.5	314 43.6	16.1	77 29.8	27.0	266 16.8	55.0	232 38.4	97	19 28.9	−123
8	104 36.5	307 34.3	18.1	329 44.4	15.7	92 32.5	26.9	281 19.0	54.9	247 07.1	95	19 41.2	−122
9	119 38.9	322 38.2	·· 18.7	344 45.3	·· 15.2	107 35.2	·· 26.8	296 21.2	·· 54.7	261 35.6	94	·19 53.4	−121
10	134 41.4	337 42.0	19.3	359 46.1	14.8	122 37.9	26.7	311 23.4	54.6	276 04.0	93	20 05.5	−120
11	149 43.8	352 45.8	19.9	14 47.0	14.4	137 40.6	26.6	326 25.6	54.5	290 32.3	93	20 17.5	−118
12	164 46.3	7 49.7	+ 0 20.5	29 47.9	+18 13.9	152 43.3	+ 3 26.5	341 27.8	+ 0 54.4	305 00.6	91	−20 29.3	−118
13	179 48.8	22 53.5	21.1	44 48.7	13.5	167 46.0	26.4	356 30.0	54.3	319 28.7	89	20 41.1	−117
14	194 51.2	37 57.3	21.7	59 49.6	13.1	182 48.7	26.3	11 32.2	54.1	333 56.6	89	20 52.8	−115
15	209 53.7	53 01.2	·· 22.3	74 50.4	·· 12.7	197 51.4	·· 26.2	26 34.4	·· 54.0	348 24.5	88	·21 04.3	−115
16	224 56.2	68 05.0	22.8	89 51.3	12.2	212 54.1	26.1	41 36.5	53.9	2 52.3	87	21 15.8	−113
17	239 58.6	83 08.8	23.4	104 52.2	11.8	227 56.8	26.0	56 38.7	53.8	17 20.0	85	21 27.1	−112
18	255 01.1	98 12.7	+ 0 24.0	119 53.0	+18 11.4	242 59.4	+ 3 25.9	71 40.9	+ 0 53.7	31 47.5	85	−21 38.3	−111
19	270 03.6	113 16.5	24.6	134 53.9	10.9	258 02.1	25.8	86 43.1	53.5	46 15.0	83	21 49.4	−110
20	285 06.0	128 20.3	25.2	149 54.7	10.5	273 04.8	25.7	101 45.3	53.4	60 42.3	83	22 00.4	−109
21	300 08.5	143 24.1	·· 25.8	164 55.6	·· 10.1	288 07.5	·· 25.5	116 47.5	·· 53.3	75 09.6	81	·22 11.3	−107
22	315 10.9	158 28.0	26.4	179 56.5	09.6	303 10.2	25.4	131 49.7	53.2	89 36.7	80	22 22.0	−106
23	330 13.4	173 31.8	27.0	194 57.3	09.2	318 12.9	25.3	146 51.9	53.1	104 03.7	79	22 32.6	−105
24	345 15.9	188 35.6	+ 0 27.6	209 58.2	+18 08.8	333 15.6	+ 3 25.2	161 54.1	+ 0 52.9	118 30.6	78	−22 43.1	−104
code	—	+ 39	+ 6	+ 9	− 4	+ 27	− 1	+ 21	− 1				

GCT	SUN GHA	SUN Dec.
h	° ′	° ′
0	180 09.3	+ 7 34.3
1	195 09.5	33.4
2	210 09.7	32.5
3	225 10.0 ··	31.5
4	240 10.2	30.6
5	255 10.4	29.7
6	270 10.6	+ 7 28.8
7	285 10.8	27.9
8	300 11.0	26.9
9	315 11.2 ··	26.0
10	330 11.4	25.1
11	345 11.6	24.2
12	0 11.8	+ 7 23.3
13	15 12.0	22.4
14	30 12.2	21.4
15	45 12.4 ··	20.5
16	60 12.6	19.6
17	75 12.8	18.7
18	90 13.0	+ 7 17.7
19	105 13.2	16.8
20	120 13.4	15.9
21	135 13.6 ··	15.0
22	150 13.8	14.1
23	165 14.0	13.1
0	180 14.2	+ 7 12.2
1	195 14.4	11.3
2	210 14.6	10.4
3	225 14.8 ··	09.4
4	240 15.0	08.5
5	255 15.2	07.6
6	270 15.5	+ 7 06.7
7	285 15.7	05.7
8	300 15.9	04.8
9	315 16.1 ··	03.9
10	330 16.3	03.0
11	345 16.5	02.0
12	0 16.7	+ 7 01.1
13	15 16.9	7 00.2
14	30 17.1	6 59.3
15	45 17.3 ··	58.3
16	60 17.5	57.4
17	75 17.7	56.5
18	90 17.9	+ 6 55.6
19	105 18.1	54.6
20	120 18.3	53.7
21	135 18.5 ··	52.8
22	150 18.8	51.9
23	165 19.0	50.9
0	180 19.2	+ 6 50.0
1	195 19.4	49.1
2	210 19.6	48.2
3	225 19.8 ··	47.2
4	240 20.0	46.3
5	255 20.2	45.4
6	270 20.4	+ 6 44.4
7	285 20.6	43.5
8	300 20.8	42.6
9	315 21.0 ··	41.7
10	330 21.2	40.7
11	345 21.5	39.8
12	0 21.7	+ 6 38.9
13	15 21.9	37.9
14	30 22.1	37.0
15	45 22.3 ··	36.1
16	60 22.5	35.1
17	75 22.7	34.2
18	90 22.9	+ 6 33.3
19	105 23.1	32.4
20	120 23.3	31.4
21	135 23.5 ··	30.5
22	150 23.8	29.6
23	165 24.0	28.6
24	180 24.2	+ 6 27.7
code	—	− 9

STARS No.	SHA	Dec.	Transit Mer. Gr.
	° ′	° ′	h m
1	358 31.4	+28 49.5	1 13
2	358 20.8	+58 53.0	1 13
3	349 42.1	−18 14.9	1 48
4	339 20.1	+59 59.1	2 29
5	336 00.5	−57 28.5	2 42
6	332 25.1	+89 02.1	2 57
7	328 53.1	+23 14.2	3 11
8	315 53.2	−40 29.4	4 03
9	309 46.9	+49 41.5	4 27
10	291 42.7	+16 25.0	5 39
11	281 56.7	− 8 15.0	6 18
12	281 43.2	+45 57.1	6 19
13	279 21.9	+ 6 18.7	6 28
14	279 11.4	+28 34.2	6 29
15	276 33.6	− 1 13.6	6 39
16	271 51.7	+ 7 24.2	6 58
17	264 17.0	−52 39.7	7 28
18	259 14.8	−16 38.5	7 49
19	255 49.3	−28 53.9	8 02
20	245 48.5	+ 5 21.2	8 42
21	244 24.7	+28 08.8	8 48
22	234 37.8	−59 20.9	9 27
23	223 27.2	−43 13.9	10 11
24	221 50.9	−69 30.8	10 18
25	218 42.0	− 8 26.7	10 30
26	208 33.2	+12 12.4	11 11
27	194 48.9	+62 00.8	12 06
28	183 21.2	+14 50.6	12 51
29	174 02.3	−62 50.0	13 28
30	172 53.6	−56 50.7	13 33
31	168 47.4	−59 25.6	13 49
32	167 01.6	+56 13.4	13 56
33	159 30.4	+55 10.8	14 26
34	159 20.5	−10 54.6	14 27
35	153 35.5	+49 33.4	14 50
36	149 02.8	−36 08.1	15 08
37	146 38.2	+19 26.1	15 18
38	140 56.0	−60 38.6	15 41
39	137 17.8	+74 21.4	15 55
40	126 50.4	+26 52.7	16 37
41	120 37.9	−22 29.3	17 02
42	113 23.3	−26 19.8	17 30
43	109 07.0	−68 56.9	17 47
44	103 05.8	−15 40.1	18 11
45	97 24.9	−37 04.5	18 34
46	96 49.5	+12 35.7	18 36
47	91 07.6	+51 29.8	18 59
48	84 45.2	−34 24.8	19 25
49	81 10.2	+38 44.4	19 39
50	76 55.6	−26 21.7	19 56
51	62 53.3	+ 8 44.4	20 52
52	54 31.7	−56 53.7	21 25
53	50 02.9	+45 06.5	21 43
54	34 32.4	+ 9 39.2	22 45
55	28 41.3	−47 11.7	23 08
56	16 14.7	−29 52.6	0 02
57	14 24.3	+14 56.8	0 09

Lat.	Sunrise	Twlt. begins	Moonrise 4	Moonrise 5	Moonrise 6	Moonrise 7
N °	h m	h m	h m	h m	h m	h m
70	4 28	////	9 45	12 09	■	■
68	4 38	////	9 33	11 42	14 38	■
66	4 45	////	9 24	11 21	13 41	■
64	4 52	0 55	9 16	11 05	13 08	15 45
62	4 58	1 41	9 09	10 52	12 44	14 48
60	5 02	2 08	9 03	10 40	12 25	14 15
58	5 07	2 30	8 58	10 31	12 09	13 51
56	5 10	2 46	8 53	10 22	11 56	13 32
54	5 14	2 59	8 49	10 15	11 44	13 16
52	5 17	3 10	8 45	10 08	11 34	13 02
50	5 20	3 20	8 42	10 02	11 25	12 49
45	5 26	3 40	8 35	9 49	11 06	12 25
40	5 31	3 56	8 29	9 38	10 51	12 05
35	5 35	4 07	8 24	9 29	10 38	11 48
30	5 39	4 16	8 19	9 21	10 26	11 34
20	5 45	4 30	8 12	9 08	10 07	11 10
10	5 51	4 40	8 05	8 56	9 51	10 49
0	5 56	4 47	7 59	8 45	9 35	10 30
10	6 01	4 51	7 52	8 34	9 20	10 11
20	6 06	4 54	7 46	8 23	9 04	9 51
30	6 12	4 53	7 39	8 10	8 46	9 28
35	6 15	4 52	7 34	8 03	8 35	9 14
40	6 18	4 50	7 30	7 54	8 23	8 58
45	6 23	4 47	7 24	7 44	8 09	8 40
50	6 28	4 42	7 18	7 33	7 51	8 17
52	6 30	4 40	7 15	7 27	7 43	8 06
54	6 33	4 37	7 11	7 21	7 34	7 54
56	6 35	4 34	7 08	7 15	7 24	7 40
58	6 38	4 30	7 04	7 07	7 13	7 23
60	6 42	4 26	6 59	6 59	7 00	7 03
S						

Lat.	Sunset	Twlt. ends	Moonset 4	Moonset 5	Moonset 6	Moonset 7
N °	h m	h m	h m	h m	h m	h m
70	19 26	////	18 06	17 20	■	■
68	19 18	////	18 20	17 49	16 40	■
66	19 10	////	18 31	18 12	17 38	■
64	19 04	22 50	18 41	18 29	18 13	17 32
62	18 59	22 10	18 49	18 44	18 38	18 29
60	18 54	21 43	18 57	18 57	18 58	19 03
58	18 50	21 24	19 03	19 07	19 14	19 27
56	18 46	21 08	19 09	19 17	19 28	19 47
54	18 43	20 55	19 14	19 25	19 40	20 04
52	18 40	20 44	19 19	19 33	19 51	20 18
50	18 37	20 34	19 23	19 40	20 01	20 31
45	18 31	20 15	19 32	19 54	20 21	20 57
40	18 26	20 00	19 40	20 06	20 38	21 18
35	18 22	19 49	19 47	20 17	20 52	21 35
30	18 19	19 41	19 53	20 26	21 04	21 50
20	18 12	19 26	20 03	20 42	21 25	22 15
10	18 07	19 18	20 12	20 56	21 44	22 37
0	18 02	19 11	20 20	21 09	22 01	22 58
10	17 57	19 07	20 29	21 22	22 18	23 19
20	17 52	19 05	20 38	21 36	22 37	23 41
30	17 47	19 07	20 49	21 52	22 58	24 07
35	17 44	19 08	20 55	22 02	23 11	24 22
40	17 40	19 10	21 02	22 12	23 26	24 40
45	17 36	19 14	21 10	22 25	23 43	25 01
50	17 31	19 19	21 20	22 41	24 05	0 05
52	17 29	19 21	21 24	22 48	24 15	0 15
54	17 26	19 24	21 29	22 56	24 27	0 27
56	17 24	19 28	21 35	23 06	24 41	0 41
58	17 21	19 32	21 41	23 16	24 56	0 56
60	17 17	19 36	21 48	23 29	25 15	1 15
S						

GCT	Equation of Time (App.—Mean) 4	5	6
h	m s	m s	m s
0	+ 0 37.0	+ 0 56.5	+ 1 16.3
6	+ 0 41.8	+ 1 01.4	+ 1 21.3
12	+ 0 46.7	+ 1 06.3	+ 1 26.2
18	+ 0 51.6	+ 1 11.3	+ 1 31.3
24	+ 0 56.5	+ 1 16.3	+ 1 36.3

GCT of Transit Meridian of Greenwich

DAY	Moon	Venus	Mars	Jupiter	Saturn
	h m	h m	h m	h m	h m
4	14 09	11 41	10 04	2 00	13 21
5	14 57	11 35	10 02	1 55	13 18
6	15 48	11 29	10 01	1 51	13 14
7	16 44	11 23	10 00	1 47	13 11

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb	Venus	Mars
°	′	′	′
0			
	0.2	0.5	0.1
30			
	0.2	0.4	0.0
45			
	0.2	0.3	0.0
60			
	0.2	0.2	0.0
75			
	0.2	0.1	0.0
90			

Moon's Lower Limb

Add

Alt.	4	5	6
°	′	′	′
0			
	15.9	16.6	17.1
4			
	15.9	16.6	17.1
8			
	15.9	16.6	17.1
12			
	15.9	16.5	17.0
16			
	15.9	16.5	17.0
20			
	15.9	16.5	17.0
24			
	15.9	16.5	17.0
28			
	15.9	16.5	16.9
32			
	15.9	16.4	16.9
36			
	15.9	16.4	16.8
40			
	15.9	16.4	16.8
44			
	15.8	16.3	16.7
48			
	15.8	16.3	16.6
52			
	15.8	16.2	16.6
56			
	15.8	16.2	16.5
60			
	15.8	16.1	16.4
64			
	15.8	16.1	16.4
68			
	15.7	16.0	16.3
72			
	15.7	16.0	16.2
76			
	15.7	15.9	16.1
80			
	15.7	15.9	16.0
84			
	15.7	15.8	16.0
88			
	15.6	15.8	15.9
90			

Add to table, back cover

Moon's Upper Limb

Subtract

Alt.	4	5	6
°	′	′	′
0			
	15.3	15.0	14.7
4			
	15.3	15.0	14.7
8			
	15.3	15.0	14.7
12			
	15.3	15.0	14.7
16			
	15.3	15.0	14.7
20			
	15.4	15.0	14.8
24			
	15.4	15.0	14.8
28			
	15.4	15.1	14.8
32			
	15.4	15.1	14.9
36			
	15.4	15.1	14.9
40			
	15.4	15.2	15.0
44			
	15.4	15.2	15.0
48			
	15.4	15.3	15.1
52			
	15.5	15.3	15.2
56			
	15.5	15.3	15.2
60			
	15.5	15.4	15.3
64			
	15.5	15.4	15.4
68			
	15.5	15.5	15.5
72			
	15.5	15.5	15.5
76			
	15.6	15.6	15.6
80			
	15.6	15.7	15.7
84			
	15.6	15.7	15.8
88			
	15.6	15.8	15.9
90			

Subtract from table, back cover

GCT	♈	VENUS −3.3		MARS 1.9		JUPITER −2.4		SATURN 1.2		MOON			
	GHA	GHA	Dec.	GHA	Dec.	GHA	Dec.	GHA	Dec.	GHA	code	Dec.	code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
0	345 15.9	188 35.6	+ 0 27.6	209 58.2	+18 08.8	333 15.6	+ 3 25.2	161 54.1	+ 0 52.9	118 30.6	78	−22 43.1	−104
1	0 18.3	203 39.4	28.2	224 59.0	08.3	348 18.3	25.1	176 56.3	52.8	132 57.4	77	22 53.5	−102
2	15 20.8	218 43.2	28.8	239 59.9	07.9	3 21.0	25.0	191 58.5	52.7	147 24.1	75	23 03.7	−101
3	30 23.3	233 47.1	·· 29.4	255 00.8	·· 07.5	18 23.7	·· 24.9	207 00.7	·· 52.6	161 50.6	75	·23 13.8	−100
4	45 25.7	248 50.9	30.0	270 01.6	07.0	33 26.4	24.8	222 02.8	52.5	176 17.1	73	23 23.8	− 99
5	60 28.2	263 54.7	30.6	285 02.5	06.6	48 29.1	24.7	237 05.0	52.3	190 43.4	73	23 33.7	− 97
6	75 30.7	278 58.5	+ 0 31.3	300 03.3	+18 06.2	63 31.8	+ 3 24.6	252 07.2	+ 0 52.2	205 09.7	71	−23 43.4	− 96
7	90 33.1	294 02.3	31.9	315 04.2	05.7	78 34.5	24.5	267 09.4	52.1	219 35.8	70	23 53.0	− 94
8	105 35.6	309 06.1	32.5	330 05.1	05.3	93 37.2	24.4	282 11.6	52.0	234 01.8	69	24 02.4	− 93
9	120 38.1	324 09.9	·· 33.1	345 05.9	·· 04.9	108 39.9	·· 24.3	297 13.8	·· 51.9	248 27.7	69	·24 11.7	− 92
10	135 40.5	339 13.7	33.7	0 06.8	04.5	123 42.6	24.2	312 16.0	51.8	262 53.6	67	24 20.9	− 90
11	150 43.0	354 17.5	34.3	15 07.7	04.0	138 45.3	24.1	327 18.2	51.6	277 19.3	66	24 29.9	− 89
12	165 45.4	9 21.3	+ 0 34.9	30 08.5	+18 03.6	153 48.0	+ 3 24.0	342 20.4	+ 0 51.5	291 44.9	64	−24 38.8	− 87
13	180 47.9	24 25.1	35.5	45 09.4	03.2	168 50.7	23.8	357 22.6	51.4	306 10.3	64	24 47.5	− 86
14	195 50.4	39 28.9	36.1	60 10.3	02.7	183 53.4	23.7	12 24.8	51.3	320 35.7	63	24 56.1	− 84
15	210 52.8	54 32.7	·· 36.7	75 11.1	·· 02.3	198 56.1	·· 23.6	27 27.0	·· 51.2	335 01.0	62	·25 04.5	− 83
16	225 55.3	69 36.5	37.4	90 12.0	01.8	213 58.8	23.5	42 29.1	51.0	349 26.2	60	25 12.8	− 81
17	240 57.8	84 40.3	38.0	105 12.8	01.4	229 01.5	23.4	57 31.3	50.9	3 51.2	60	25 20.9	− 80
18	256 00.2	99 44.1	+ 0 38.6	120 13.7	+18 01.0	244 04.2	+ 3 23.3	72 33.5	+ 0 50.8	18 16.2	59	−25 28.9	− 78
19	271 02.7	114 47.8	39.2	135 14.6	00.5	259 06.9	23.2	87 35.7	50.7	32 41.1	57	25 36.7	− 77
20	286 05.2	129 51.6	39.8	150 15.4	18 00.1	274 09.6	23.1	102 37.9	50.6	47 05.8	57	25 44.4	− 75
21	301 07.6	144 55.4	·· 40.4	165 16.3	·17 59.7	289 12.3	·· 23.0	117 40.1	·· 50.4	61 30.5	56	·25 51.9	− 74
22	316 10.1	159 59.2	41.1	180 17.2	59.2	304 15.0	22.9	132 42.3	50.3	75 55.1	54	25 59.3	− 71
23	331 12.6	175 03.0	41.7	195 18.0	58.8	319 17.7	22.8	147 44.5	50.2	90 19.5	54	26 06.4	− 71
0	346 15.0	190 06.7	+ 0 42.3	210 18.9	+17 58.4	334 20.4	+ 3 22.7	162 46.7	+ 0 50.1	104 43.9	53	−26 13.5	− 68
1	1 17.5	205 10.5	42.9	225 19.8	57.9	349 23.1	22.6	177 48.9	50.0	119 08.2	52	26 20.3	− 67
2	16 19.9	220 14.3	43.6	240 20.6	57.5	4 25.8	22.4	192 51.1	49.8	133 32.4	50	26 27.0	− 66
3	31 22.4	235 18.0	·· 44.2	255 21.5	·· 57.1	19 28.5	·· 22.3	207 53.2	·· 49.7	147 56.4	50	·26 33.6	− 63
4	46 24.9	250 21.8	44.8	270 22.4	56.6	34 31.2	22.2	222 55.4	49.6	162 20.4	49	26 39.9	− 62
5	61 27.3	265 25.6	45.4	285 23.2	56.2	49 33.9	22.1	237 57.6	49.5	176 44.3	49	26 46.1	− 60
6	76 29.8	280 29.3	+ 0 46.1	300 24.1	+17 55.7	64 36.6	+ 3 22.0	252 59.8	+ 0 49.4	191 08.2	47	−26 52.1	− 59
7	91 32.3	295 33.1	46.7	315 25.0	55.3	79 39.3	21.9	268 02.0	49.2	205 31.9	46	26 58.0	− 56
8	106 34.7	310 36.9	47.3	330 25.8	54.9	94 42.0	21.8	283 04.2	49.1	219 55.5	46	27 03.6	− 55
9	121 37.2	325 40.6	·· 47.9	345 26.7	·· 54.4	109 44.7	·· 21.7	298 06.4	·· 49.0	234 19.1	45	·27 09.1	− 54
10	136 39.7	340 44.4	48.6	0 27.6	54.0	124 47.4	21.6	313 08.6	48.9	248 42.6	44	27 14.5	− 51
11	151 42.1	355 48.1	49.2	15 28.4	53.6	139 50.1	21.5	328 10.8	48.8	263 06.0	43	27 19.6	− 50
12	166 44.6	10 51.9	+ 0 49.8	30 29.3	+17 53.1	154 52.8	+ 3 21.4	343 13.0	+ 0 48.6	277 29.3	42	−27 24.6	− 47
13	181 47.0	25 55.6	50.5	45 30.2	52.7	169 55.5	21.2	358 15.1	48.5	291 52.5	42	27 29.3	− 46
14	196 49.5	40 59.4	51.1	60 31.0	52.2	184 58.2	21.1	13 17.3	48.4	306 15.7	41	27 33.9	− 45
15	211 52.0	56 03.1	·· 51.7	75 31.9	·· 51.8	200 00.9	·· 21.0	28 19.5	·· 48.3	320 38.8	40	·27 38.4	− 42
16	226 54.4	71 06.8	52.4	90 32.8	51.4	215 03.7	20.9	43 21.7	48.2	335 01.8	40	27 42.6	− 40
17	241 56.9	86 10.6	53.0	105 33.7	50.9	230 06.4	20.8	58 23.9	48.0	349 24.8	39	27 46.6	− 39
18	256 59.4	101 14.3	+ 0 53.6	120 34.5	+17 50.5	245 09.1	+ 3 20.7	73 26.1	+ 0 47.9	3 47.7	38	−27 50.5	− 37
19	272 01.8	116 18.0	54.3	135 35.4	50.0	260 11.8	20.6	88 28.3	47.8	18 10.5	38	27 54.2	− 35
20	287 04.3	131 21.8	54.9	150 36.3	49.6	275 14.5	20.5	103 30.5	47.7	32 33.3	37	27 57.7	− 33
21	302 06.8	146 25.5	·· 55.5	165 37.1	·· 49.2	290 17.2	·· 20.4	118 32.7	·· 47.6	46 56.0	36	·28 01.0	− 31
22	317 09.2	161 29.2	56.2	180 38.0	48.7	305 19.9	20.3	133 34.9	47.4	61 18.6	36	28 04.1	− 29
23	332 11.7	176 32.9	56.8	195 38.9	48.3	320 22.6	20.1	148 37.0	47.3	75 41.2	35	28 07.0	− 28
0	347 14.2	191 36.7	+ 0 57.4	210 39.7	+17 47.8	335 25.3	+ 3 20.0	163 39.2	+ 0 47.2	90 03.7	35	−28 09.8	− 25
1	2 16.6	206 40.4	58.1	225 40.6	47.4	350 28.0	19.9	178 41.4	47.1	104 26.2	34	28 12.3	− 23
2	17 19.1	221 44.1	58.7	240 41.5	47.0	5 30.7	19.8	193 43.6	46.9	118 48.6	34	28 14.6	− 22
3	32 21.5	236 47.8	· 0 59.3	255 42.4	·· 46.5	20 33.4	·· 19.7	208 45.8	·· 46.8	133 11.0	34	·28 16.8	− 20
4	47 24.0	251 51.5	1 00.0	270 43.2	46.1	35 36.1	19.6	223 48.0	46.7	147 33.4	33	28 18.8	− 17
5	62 26.5	266 55.3	00.6	285 44.1	45.6	50 38.8	19.5	238 50.2	46.6	161 55.7	32	28 20.5	− 16
6	77 28.9	281 59.0	+ 1 01.3	300 45.0	+17 45.2	65 41.5	+ 3 19.4	253 52.4	+ 0 46.5	176 17.9	33	−28 22.1	− 14
7	92 31.4	297 02.7	01.9	315 45.8	44.8	80 44.3	19.3	268 54.6	46.3	190 40.2	32	28 23.5	− 11
8	107 33.9	312 06.4	02.6	330 46.7	44.3	95 47.0	19.2	283 56.8	46.2	205 02.4	31	28 24.6	− 10
9	122 36.3	327 10.1	·· 03.2	345 47.6	·· 43.9	110 49.7	·· 19.0	298 58.9	·· 46.1	219 24.5	32	·28 25.6	− 8
10	137 38.8	342 13.8	03.8	0 48.5	43.4	125 52.4	18.9	314 01.1	46.0	233 46.7	31	28 26.4	− 6
11	152 41.3	357 17.5	04.5	15 49.3	43.0	140 55.1	18.8	329 03.3	45.9	248 08.8	31	28 27.0	− 4
12	167 43.7	12 21.2	+ 1 05.1	30 50.2	+17 42.5	155 57.8	+ 3 18.7	344 05.5	+ 0 45.7	262 30.9	30	−28 27.4	− 1
13	182 46.2	27 24.8	05.8	45 51.1	42.1	171 00.5	18.6	359 07.7	45.6	276 52.9	31	28 27.5	0
14	197 48.7	42 28.5	06.4	60 51.9	41.7	186 03.2	18.5	14 09.9	45.5	291 15.0	30	28 27.5	+ 2
15	212 51.1	57 32.2	·· 07.1	75 52.8	·· 41.2	201 05.9	·· 18.4	29 12.1	·· 45.4	305 37.0	30	·28 27.3	+ 4
16	227 53.6	72 35.9	07.7	90 53.7	40.8	216 08.6	18.3	44 14.3	45.3	319 59.0	30	28 26.9	+ 6
17	242 56.0	87 39.6	08.4	105 54.6	40.3	231 11.3	18.2	59 16.5	45.1	334 21.0	30	28 26.3	+ [illegible]
18	257 58.5	102 43.3	+ 1 09.0	120 55.4	+17 39.9	246 14.1	+ 3 18.0	74 18.6	+ 0 45.0	348 43.0	30	−28 25.5	+ 10
19	273 01.0	117 46.9	09.6	135 56.3	39.4	261 16.8	17.9	89 20.8	44.9	3 05.0	30	28 24.5	+ 12
20	288 03.4	132 50.6	10.3	150 57.2	39.0	276 19.5	17.8	104 23.0	44.8	17 27.0	30	28 23.3	+ 14
21	303 05.9	147 54.3	·· 10.9	165 58.1	·· 38.6	291 22.2	·· 17.7	119 25.2	·· 44.7	31 49.0	30	·28 21.9	+ 16
22	318 08.4	162 57.9	11.6	180 58.9	38.1	306 24.9	17.6	134 27.4	44.5	46 11.0	30	28 20.3	+ 19
23	333 10.8	178 01.6	12.2	195 59.8	37.7	321 27.6	17.5	149 29.6	44.4	60 33.0	30	28 18.4	+ 20
24	348 13.3	193 05.3	+ 1 12.9	211 00.7	+17 37.2	336 30.3	+ 3 17.4	164 31.8	+ 0 44.3	74 55.0	30	−28 16.4	+ 22
code	−	+ 37	+ 7	+ 9	− 4	+ 27	− 2	+ 21	− 1				

GCT	SUN GHA	SUN Dec.
h	° ′	° ′
0	180 24.2	+ 6 27.7
1	195 24.4	26.8
2	210 24.6	25.8
3	225 24.8	·· 24.9
4	240 25.0	24.0
5	255 25.2	23.0
6	270 25.4	+ 6 22.1
7	285 25.6	21.2
8	300 25.9	20.2
9	315 26.1	·· 19.3
10	330 26.3	18.4
11	345 26.5	17.4
12	0 26.7	+ 6 16.5
13	15 26.9	15.6
14	30 27.1	14.6
15	45 27.3	·· 13.7
16	60 27.5	12.8
17	75 27.8	11.8
18	90 28.0	+ 6 10.9
19	105 28.2	10.0
20	120 28.4	09.0
21	135 28.6	·· 08.1
22	150 28.8	07.1
23	165 29.0	06.2
0	180 29.2	+ 6 05.3
1	195 29.5	04.3
2	210 29.7	03.4
3	225 29.9	·· 02.5
4	240 30.1	01.5
5	255 30.3	6 00.6
6	270 30.5	+ 5 59.7
7	285 30.7	58.7
8	300 30.9	57.8
9	315 31.2	·· 56.8
10	330 31.4	55.9
11	345 31.6	55.0
12	0 31.8	+ 5 54.0
13	15 32.0	53.1
14	30 32.2	52.2
15	45 32.4	·· 51.2
16	60 32.6	50.3
17	75 32.9	49.3
18	90 33.1	+ 5 48.4
19	105 33.3	47.5
20	120 33.5	46.5
21	135 33.7	·· 45.6
22	150 33.9	44.6
23	165 34.1	43.7
0	180 34.4	+ 5 42.8
1	195 34.6	41.8
2	210 34.8	40.9
3	225 35.0	·· 39.9
4	240 35.2	39.0
5	255 35.4	38.1
6	270 35.6	+ 5 37.1
7	285 35.9	36.2
8	300 36.1	35.2
9	315 36.3	·· 34.3
10	330 36.5	33.4
11	345 36.7	32.4
12	0 36.9	+ 5 31.5
13	15 37.1	30.5
14	30 37.4	29.6
15	45 37.6	·· 28.6
16	60 37.8	27.7
17	75 38.0	26.8
18	90 38.2	+ 5 25.8
19	105 38.4	24.9
20	120 38.7	23.9
21	135 38.9	·· 23.0
22	150 39.1	22.0
23	165 39.3	21.1
24	180 39.5	+ 5 20.2
code	—	− 9

STARS No.	SHA	Dec.	Transit Mer. Gr.
	° ′	° ′	h m
1	358 31.4	+28 49.5	1 01
2	358 20.8	+58 53.0	1 01
3	349 42.1	−18 14.9	1 36
4	339 20.1	+59 59.1	2 17
5	336 00.5	−57 28.6	2 31
6	332 24.3	+89 02.1	2 45
7	328 53.1	+23 14.2	2 59
8	315 53.2	−40 29.4	3 51
9	309 46.9	+49 41.5	4 15
10	291 42.7	+16 25.0	5 27
11	281 56.7	− 8 15.0	6 06
12	281 43.2	+45 57.1	6 07
13	279 21.9	+ 6 18.7	6 17
14	279 11.4	+28 34.2	6 17
15	276 33.6	− 1 13.6	6 28
16	271 51.7	+ 7 24.2	6 46
17	264 17.0	−52 39.7	7 17
18	259 14.8	−16 38.5	7 37
19	255 49.2	−28 53.9	7 50
20	245 48.5	+ 5 21.2	8 30
21	244 24.7	+28 08.8	8 36
22	234 37.7	−59 20.9	9 15
23	223 27.2	−43 13.9	10 00
24	221 50.9	−69 30.8	10 06
25	218 42.0	− 8 26.7	10 19
26	208 33.2	+12 12.4	10 59
27	194 48.8	+62 00.8	11 54
28	183 21.2	+14 50.6	12 40
29	174 02.3	−62 50.0	13 17
30	172 53.6	−56 50.7	13 21
31	168 47.5	−59 25.6	13 38
32	167 01.6	+56 13.4	13 45
33	159 30.4	+55 10.8	14 15
34	159 20.5	−10 54.6	14 15
35	153 35.6	+49 33.4	14 38
36	149 02.8	−36 08.1	14 56
37	146 38.2	+19 26.1	15 06
38	140 56.0	−60 38.6	15 29
39	137 17.9	+74 21.3	15 43
40	126 50.4	+26 52.7	16 25
41	120 37.9	−22 29.3	16 50
42	113 23.3	−26 19.8	17 19
43	109 07.0	−68 56.9	17 36
44	103 05.8	−15 40.1	18 00
45	97 25.0	−37 04.5	18 22
46	96 49.5	+12 35.7	18 25
47	91 07.6	+51 29.8	18 47
48	84 45.2	−34 24.8	19 13
49	81 10.3	+38 44.4	19 27
50	76 55.6	−26 21.7	19 44
51	62 53.3	+ 8 44.4	20 40
52	54 31.7	−56 53.7	21 13
53	50 02.9	+45 06.5	21 31
54	34 32.4	+ 9 39.3	22 33
55	28 41.3	−47 11.8	22 56
56	16 14.7	−29 52.6	23 46
57	14 24.3	+14 56.8	23 53

Lat.	Sunrise	Twlt. begins	Moonrise 7	Moonrise 8	Moonrise 9	Moonrise 10
N °	h m	h m	h m	h m	h m	h m
70	4 41	////	■	■	■	■
68	4 49	////	■	■	■	■
66	4 55	////	■	■	■	■
64	5 01	1 25	15 45	■	■	■
62	5 05	1 59	14 48	17 30	■	18 47
60	5 09	2 22	14 15	16 05	17 26	17 59
58	5 13	2 40	13 51	15 29	16 45	17 28
56	5 16	2 54	13 32	15 03	16 17	17 04
54	5 19	3 07	13 16	14 43	15 55	16 45
52	5 22	3 17	13 02	14 26	15 36	16 28
50	5 24	3 27	12 49	14 11	15 21	16 14
45	5 29	3 45	12 25	13 41	14 50	15 46
40	5 34	3 59	12 05	13 18	14 25	15 23
35	5 37	4 09	11 48	12 59	14 05	15 04
30	5 40	4 19	11 34	12 43	13 48	14 48
20	5 46	4 31	11 10	12 15	13 20	14 21
10	5 50	4 40	10 49	11 51	12 55	13 57
0	5 55	4 46	10 30	11 30	12 32	13 35
10	5 59	4 49	10 11	11 08	12 09	13 13
20	6 03	4 51	9 51	10 44	11 45	12 50
30	6 08	4 50	9 28	10 18	11 16	12 22
35	6 10	4 48	9 14	10 02	10 59	12 06
40	6 13	4 45	8 58	9 43	10 40	11 47
45	6 17	4 41	8 40	9 21	10 16	11 24
50	6 21	4 35	8 17	8 53	9 45	10 54
52	6 23	4 32	8 06	8 39	9 30	10 40
54	6 25	4 30	7 54	8 24	9 12	10 23
56	6 27	4 26	7 40	8 05	8 51	10 03
58	6 30	4 22	7 23	7 43	8 24	9 37
60	6 32	4 16	7 03	7 14	7 45	9 02
S						

Lat.	Sunset	Twlt. ends	Moonset 7	Moonset 8	Moonset 9	Moonset 10
N °	h m	h m	h m	h m	h m	h m
70	19 12	////	■	■	■	■
68	19 05	////	■	■	■	■
66	18 59	23 22	■	■	■	■
64	18 53	22 21	17 32	■	■	■
62	18 49	21 51	18 29	17 53	■	21 01
60	18 45	21 28	19 03	19 18	20 09	21 50
58	18 41	21 10	19 27	19 55	20 51	22 20
56	18 38	20 57	19 47	20 21	21 19	22 43
54	18 35	20 44	20 04	20 42	21 41	23 02
52	18 33	20 35	20 18	20 59	21 59	23 18
50	18 31	20 26	20 31	21 14	22 14	23 32
45	18 26	20 09	20 57	21 44	22 46	24 00
40	18 22	19 55	21 18	22 08	23 10	24 22
35	18 18	19 44	21 35	22 27	23 30	24 40
30	18 15	19 36	21 50	22 44	23 46	24 55
20	18 10	19 24	22 15	23 12	24 15	0 15
10	18 05	19 15	22 37	23 36	24 40	0 40
0	18 01	19 10	22 58	23 59	25 02	1 02
10	17 57	19 07	23 19	24 22	0 22	1 25
20	17 53	19 06	23 41	24 46	0 46	1 49
30	17 48	19 07	24 07	0 07	1 14	2 17
35	17 46	19 10	24 22	0 22	1 31	2 34
40	17 43	19 13	24 40	0 40	1 50	2 53
45	17 40	19 18	25 01	1 01	2 14	3 17
50	17 36	19 24	0 05	1 28	2 45	3 47
52	17 34	19 27	0 15	1 42	3 00	4 01
54	17 32	19 30	0 27	1 57	3 17	4 19
56	17 30	19 34	0 41	2 15	3 39	4 39
58	17 27	19 39	0 56	2 37	4 06	5 05
60	17 25	19 45	1 15	3 06	4 44	5 40
S						

GCT	Equation of Time (App.—Mean) 7	8	9
h	m s	m s	m s
0	+ 1 36.3	+ 1 56.5	+ 2 17.0
6	+ 1 41.3	+ 2 01.6	+ 2 22.1
12	+ 1 46.4	+ 2 06.7	+ 2 27.3
18	+ 1 51.5	+ 2 11.9	+ 2 32.5
24	+ 1 56.5	+ 2 17.0	+ 2 37.6

GCT of Transit Meridian of Greenwich

DAY	Moon	Venus	Mars	Jupiter	Saturn
	h m	h m	h m	h m	h m
7	16 44	11 23	10 00	1 47	13 11
8	17 44	11 17	9 58	1 42	13 07
9	18 47	11 11	9 57	1 38	13 04
10	19 50	11 05	9 55	1 34	13 00

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb	Venus	Mars
°	′	′	′
0			
	0.2	0.5	0.1
30			
	0.2	0.4	0.0
45			
	0.2	0.3	0.0
60			
	0.2	0.2	0.0
75			
	0.2	0.1	0.0
90			

Moon's Lower Limb
Add

Alt.	7	8	9
°	′	′	′
0			
	17.7	18.1	18.6
4			
	17.7	18.1	18.6
8			
	17.7	18.1	18.6
12			
	17.7	18.0	18.5
16			
	17.6	18.0	18.5
20			
	17.6	18.0	18.4
24			
	17.5	17.9	18.4
28			
	17.5	17.8	18.3
32			
	17.4	17.8	18.2
36			
	17.4	17.7	18.1
40			
	17.3	17.6	18.0
44			
	17.2	17.5	17.9
48			
	17.1	17.4	17.7
52			
	17.0	17.3	17.6
56			
	16.9	17.2	17.5
60			
	16.8	17.0	17.3
64			
	16.7	16.9	17.2
68			
	16.6	16.8	17.0
72			
	16.5	16.6	16.9
76			
	16.4	16.5	16.7
80			
	16.3	16.4	16.5
84			
	16.1	16.2	16.4
88			
	16.0	16.1	16.2
90			

Add to table, back cover

Moon's Upper Limb
Subtract

Alt.	7	8	9
°	′	′	′
0			
	14.3	14.1	13.8
4			
	14.3	14.1	13.8
8			
	14.3	14.1	13.8
12			
	14.4	14.2	13.9
16			
	14.4	14.2	13.9
20			
	14.4	14.2	14.0
24			
	14.5	14.3	14.0
28			
	14.5	14.4	14.1
32			
	14.6	14.4	14.2
36			
	14.7	14.5	14.3
40			
	14.8	14.6	14.4
44			
	14.8	14.7	14.5
48			
	14.9	14.8	14.7
52			
	15.0	14.9	14.8
56			
	15.1	15.0	14.9
60			
	15.2	15.2	15.1
64			
	15.3	15.3	15.2
68			
	15.4	15.4	15.4
72			
	15.5	15.5	15.5
76			
	15.7	15.7	15.7
80			
	15.8	15.8	15.9
84			
	15.9	16.0	16.0
88			
	16.0	16.1	16.2
90			

Subtract from table, back cover

First Quarter 8

GCT	♈ GHA	VENUS −3.4 GHA	Dec.	MARS 1.9 GHA	Dec.	JUPITER −2.4 GHA	Dec.	SATURN 1.2 GHA	Dec.	MOON GHA	code	Dec.	code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
0	348 13.3	193 05.3	+ 1 12.9	211 00.7	+17 37.2	336 30.3	+ 3 17.4	164 31.8	+ 0 44.3	74 55.0	30	−28 16.4	+ 22
1	3 15.8	208 08.9	13.5	226 01.6	36.8	351 33.0	17.3	179 34.0	44.2	89 17.0	31	28 14.2	+ 24
2	18 18.2	223 12.6	14.2	241 02.4	36.3	6 35.7	17.1	194 36.2	44.1	103 39.1	30	28 11.8	+ 26
3	33 20.7	238 16.2	·· 14.8	256 03.3	·· 35.9	21 38.5	·· 17.0	209 38.4	·· 43.9	118 01.1	31	·28 09.2	+ 28
4	48 23.2	253 19.9	15.5	271 04.2	35.4	36 41.2	16.9	224 40.5	43.8	132 23.2	31	28 06.4	+ 30
5	63 25.6	268 23.5	16.1	286 05.1	35.0	51 43.9	16.8	239 42.7	43.7	146 45.3	31	28 03.4	+ 32
6	78 28.1	283 27.2	+ 1 16.8	301 05.9	+17 34.6	66 46.6	+ 3 16.7	254 44.9	+ 0 43.6	161 07.4	32	−28 00.2	+ 34
7	93 30.5	298 30.8	17.5	316 06.8	34.1	81 49.3	16.6	269 47.1	43.5	175 29.6	32	27 56.8	+ 36
8	108 33.0	313 34.5	18.1	331 07.7	33.7	96 52.0	16.5	284 49.3	43.3	189 51.8	32	27 53.2	+ 38
9	123 35.5	328 38.1	·· 18.8	346 08.6	·· 33.2	111 54.7	·· 16.4	299 51.5	·· 43.2	204 14.0	32	·27 49.4	+ 40
10	138 37.9	343 41.7	19.4	1 09.5	32.8	126 57.5	16.2	314 53.7	43.1	218 36.2	33	27 45.4	+ 41
11	153 40.4	358 45.4	20.1	16 10.3	32.3	142 00.2	16.1	329 55.9	43.0	232 58.5	33	27 41.3	+ 44
12	168 42.9	13 49.0	+ 1 20.7	31 11.2	+17 31.9	157 02.9	+ 3 16.0	344 58.1	+ 0 42.9	247 20.8	34	−27 36.9	+ 46
13	183 45.3	28 52.6	21.4	46 12.1	31.4	172 05.6	15.9	360 00.2	42.7	261 43.2	34	27 32.3	+ 47
14	198 47.8	43 56.2	22.0	61 13.0	31.0	187 08.3	15.8	15 02.4	42.6	276 05.6	35	27 27.6	+ 50
15	213 50.3	58 59.9	·· 22.7	76 13.8	·· 30.5	202 11.0	·· 15.7	30 04.6	·· 42.5	290 28.1	35	·27 22.6	+ 51
16	228 52.7	74 03.5	23.3	91 14.7	30.1	217 13.7	15.6	45 06.8	42.4	304 50.6	35	27 17.5	+ 54
17	243 55.2	89 07.1	24.0	106 15.6	29.6	232 16.5	15.5	60 09.0	42.3	319 13.1	37	27 12.1	+ 55
18	258 57.7	104 10.7	+ 1 24.6	121 16.5	+17 29.2	247 19.2	+ 3 15.3	75 11.2	+ 0 42.1	333 35.8	36	−27 06.6	+ 57
19	274 00.1	119 14.3	25.3	136 17.4	28.7	262 21.9	15.2	90 13.4	42.0	347 58.4	38	27 00.9	+ 59
20	289 02.6	134 17.9	26.0	151 18.2	28.3	277 24.6	15.1	105 15.6	41.9	2 21.2	37	26 55.0	+ 61
21	304 05.0	149 21.5	·· 26.6	166 19.1	·· 27.8	292 27.3	·· 15.0	120 17.7	·· 41.8	16 43.9	39	·26 48.9	+ 63
22	319 07.5	164 25.1	27.3	181 20.0	27.4	307 30.0	14.9	135 19.9	41.6	31 06.8	39	26 42.6	+ 64
23	334 10.0	179 28.7	27.9	196 20.9	26.9	322 32.8	14.8	150 22.1	41.5	45 29.7	40	26 36.2	+ 67
0	349 12.4	194 32.3	+ 1 28.6	211 21.8	+17 26.5	337 35.5	+ 3 14.7	165 24.3	+ 0 41.4	59 52.7	40	−26 29.5	+ 68
1	4 14.9	209 35.9	29.2	226 22.6	26.0	352 38.2	14.5	180 26.5	41.3	74 15.7	41	26 22.7	+ 70
2	19 17.4	224 39.5	29.9	241 23.5	25.6	7 40.9	14.4	195 28.7	41.2	88 38.8	42	26 15.7	+ 72
3	34 19.8	239 43.1	·· 30.6	256 24.4	·· 25.1	22 43.6	·· 14.3	210 30.9	·· 41.0	103 02.0	43	·26 08.5	+ 74
4	49 22.3	254 46.7	31.2	271 25.3	24.7	37 46.3	14.2	225 33.1	40.9	117 25.3	43	26 01.1	+ 75
5	64 24.8	269 50.2	31.9	286 26.2	24.2	52 49.1	14.1	240 35.3	40.8	131 48.6	44	25 53.6	+ 77
6	79 27.2	284 53.8	+ 1 32.5	301 27.0	+17 23.8	67 51.8	+ 3 14.0	255 37.4	+ 0 40.7	146 12.0	45	−25 45.9	+ 79
7	94 29.7	299 57.4	33.2	316 27.9	23.3	82 54.5	13.9	270 39.6	40.6	160 35.5	46	25 38.0	+ 81
8	109 32.1	315 01.0	33.9	331 28.8	22.9	97 57.2	13.8	285 41.8	40.4	174 59.1	46	25 29.9	+ 82
9	124 34.6	330 04.5	·· 34.5	346 29.7	·· 22.4	112 59.9	·· 13.6	300 44.0	·· 40.3	189 22.7	48	·25 21.7	+ 84
10	139 37.1	345 08.1	35.2	1 30.6	22.0	128 02.6	13.5	315 46.2	40.2	203 46.5	48	25 13.3	+ 86
11	154 39.5	0 11.6	35.8	16 31.4	21.5	143 05.4	13.4	330 48.4	40.1	218 10.3	49	25 04.7	+ 87
12	169 42.0	15 15.2	+ 1 36.5	31 32.3	+17 21.1	158 08.1	+ 3 13.3	345 50.6	+ 0 40.0	232 34.2	50	−24 56.0	+ 89
13	184 44.5	30 18.8	37.2	46 33.2	20.6	173 10.8	13.2	0 52.8	39.8	246 58.2	51	24 47.1	+ 91
14	199 46.9	45 22.3	37.8	61 34.1	20.2	188 13.5	13.1	15 54.9	39.7	261 22.3	51	24 38.0	+ 93
15	214 49.4	60 25.9	·· 38.5	76 35.0	·· 19.7	203 16.2	·· 12.9	30 57.1	·· 39.6	275 46.4	53	·24 28.7	+ 94
16	229 51.9	75 29.4	39.1	91 35.9	19.3	218 19.0	12.8	45 59.3	39.5	290 10.7	53	24 19.3	+ 95
17	244 54.3	90 33.0	39.8	106 36.7	18.8	233 21.7	12.7	61 01.5	39.4	304 35.0	55	24 09.8	+ 97
18	259 56.8	105 36.5	+ 1 40.5	121 37.6	+17 18.4	248 24.4	+ 3 12.6	76 03.7	+ 0 39.2	318 59.5	55	−24 00.1	+ 99
19	274 59.3	120 40.0	41.1	136 38.5	17.9	263 27.1	12.5	91 05.9	39.1	333 24.0	56	23 50.2	+100
20	290 01.7	135 43.6	41.8	151 39.4	17.5	278 29.8	12.4	106 08.1	39.0	347 48.6	57	23 40.2	+102
21	305 04.2	150 47.1	·· 42.4	166 40.3	·· 17.0	293 32.6	·· 12.3	121 10.3	·· 38.9	2 13.3	59	·23 30.0	+104
22	320 06.6	165 50.6	43.1	181 41.2	16.6	308 35.3	12.1	136 12.4	38.8	16 38.2	59	23 19.6	+105
23	335 09.1	180 54.1	43.8	196 42.0	16.1	323 38.0	12.0	151 14.6	38.6	31 03.1	60	23 09.1	+106
0	350 11.6	195 57.7	+ 1 44.4	211 42.9	+17 15.7	338 40.7	+ 3 11.9	166 16.8	+ 0 38.5	45 28.1	61	−22 58.5	+108
1	5 14.0	211 01.2	45.1	226 43.8	15.2	353 43.4	11.8	181 19.0	38.4	59 53.2	62	22 47.7	+109
2	20 16.5	226 04.7	45.8	241 44.7	14.8	8 46.2	11.7	196 21.2	38.3	74 18.4	63	22 36.8	+111
3	35 19.0	241 08.2	·· 46.4	256 45.6	·· 14.3	23 48.9	·· 11.6	211 23.4	·· 38.1	88 43.7	64	·22 25.7	+112
4	50 21.4	256 11.7	47.1	271 46.5	13.8	38 51.6	11.4	226 25.6	38.0	103 09.1	65	22 14.5	+113
5	65 23.9	271 15.2	47.7	286 47.3	13.4	53 54.3	11.3	241 27.8	37.9	117 34.6	66	22 03.2	+115
6	80 26.4	286 18.7	+ 1 48.4	301 48.2	+17 12.9	68 57.1	+ 3 11.2	256 29.9	+ 0 37.8	132 00.2	67	−21 51.7	+116
7	95 28.8	301 22.2	49.1	316 49.1	12.5	83 59.8	11.1	271 32.1	37.7	146 25.9	68	21 40.1	+118
8	110 31.3	316 25.7	49.7	331 50.0	12.0	99 02.5	11.0	286 34.3	37.5	160 51.7	69	21 28.3	+119
9	125 33.8	331 29.2	·· 50.4	346 50.9	·· 11.6	114 05.2	·· 10.9	301 36.5	·· 37.4	175 17.6	70	·21 16.4	+120
10	140 36.2	346 32.7	51.1	1 51.8	11.1	129 07.9	10.8	316 38.7	37.3	189 43.6	71	21 04.4	+122
11	155 38.7	1 36.2	51.7	16 52.7	10.7	144 10.7	10.6	331 40.9	37.2	204 09.7	72	20 52.2	+122
12	170 41.1	16 39.7	+ 1 52.4	31 53.5	+17 10.2	159 13.4	+ 3 10.5	346 43.1	+ 0 37.1	218 35.9	73	−20 40.0	+124
13	185 43.6	31 43.1	53.0	46 54.4	09.8	174 16.1	10.4	1 45.3	36.9	233 02.2	74	20 27.6	+126
14	200 46.1	46 46.6	53.7	61 55.3	09.3	189 18.8	10.3	16 47.4	36.8	247 28.6	75	20 15.0	+126
15	215 48.5	61 50.1	·· 54.4	76 56.2	·· 08.8	204 21.6	·· 10.2	31 49.6	·· 36.7	261 55.1	76	·20 02.4	+128
16	230 51.0	76 53.6	55.0	91 57.1	08.4	219 24.3	10.1	46 51.8	36.6	276 21.7	77	19 49.6	+129
17	245 53.5	91 57.0	55.7	106 58.0	07.9	234 27.0	09.9	61 54.0	36.5	290 48.4	78	19 36.7	+130
18	260 55.9	107 00.5	+ 1 56.3	121 58.9	+17 07.5	249 29.7	+ 3 09.8	76 56.2	+ 0 36.3	305 15.2	79	−19 23.7	+131
19	275 58.4	122 03.9	57.0	136 59.8	07.0	264 32.5	09.7	91 58.4	36.2	319 42.1	80	19 10.6	+132
20	291 00.9	137 07.4	57.7	152 00.6	06.6	279 35.2	09.6	107 00.6	36.1	334 09.1	81	18 57.4	+133
21	306 03.3	152 10.9	·· 58.3	167 01.5	·· 06.1	294 37.9	·· 09.5	122 02.8	·· 36.0	348 36.2	82	·18 44.1	+135
22	321 05.8	167 14.3	59.0	182 02.4	05.6	309 40.6	09.4	137 04.9	35.8	3 03.4	83	18 30.6	+135
23	336 08.3	182 17.7	1 59.7	197 03.3	05.2	324 43.4	09.2	152 07.1	35.7	17 30.7	84	18 17.1	+137
24	351 10.7	197 21.2	+ 2 00.3	212 04.2	+17 04.7	339 46.1	+ 3 09.1	167 09.3	+ 0 35.6	31 58.1	85	−18 03.4	+137
code	—	+ 36	+ 7	+ 9	− 5	+ 27	− 1	+ 22	− 2				

GCT h	SUN GHA ° ′	SUN Dec. ° ′
0	180 39.5	+ 5 20.2
1	195 39.7	19.2
2	210 39.9	18.3
3	225 40.2	·· 17.3
4	240 40.4	16.4
5	255 40.6	15.4
6	270 40.8	+ 5 14.5
7	285 41.0	13.5
8	300 41.2	12.6
9	315 41.5	·· 11.7
10	330 41.7	10.7
11	345 41.9	09.8
12	0 42.1	+ 5 08.8
13	15 42.3	07.9
14	30 42.6	06.9
15	45 42.8	·· 06.0
16	60 43.0	05.0
17	75 43.2	04.1
18	90 43.4	+ 5 03.1
19	105 43.6	02.2
20	120 43.9	01.2
21	135 44.1	· 5 00.3
22	150 44.3	4 59.4
23	165 44.5	58.4
0	180 44.7	+ 4 57.5
1	195 44.9	56.5
2	210 45.2	55.6
3	225 45.4	·· 54.6
4	240 45.6	53.7
5	255 45.8	52.7
6	270 46.0	+ 4 51.8
7	285 46.2	50.8
8	300 46.5	49.9
9	315 46.7	·· 48.9
10	330 46.9	48.0
11	345 47.1	47.0
12	0 47.3	+ 4 46.1
13	15 47.6	45.1
14	30 47.8	44.2
15	45 48.0	·· 43.2
16	60 48.2	42.3
17	75 48.4	41.3
18	90 48.7	+ 4 40.4
19	105 48.9	39.4
20	120 49.1	38.5
21	135 49.3	·· 37.5
22	150 49.5	36.6
23	165 49.7	35.6
0	180 50.0	+ 4 34.7
1	195 50.2	33.7
2	210 50.4	32.8
3	225 50.6	·· 31.8
4	240 50.8	30.9
5	255 51.1	29.9
6	270 51.3	+ 4 29.0
7	285 51.5	28.0
8	300 51.7	27.1
9	315 51.9	·· 26.1
10	330 52.2	25.2
11	345 52.4	24.2
12	0 52.6	+ 4 23.3
13	15 52.8	22.3
14	30 53.0	21.4
15	45 53.3	·· 20.4
16	60 53.5	19.4
17	75 53.7	18.5
18	90 53.9	+ 4 17.5
19	105 54.1	16.6
20	120 54.4	15.6
21	135 54.6	·· 14.7
22	150 54.8	13.7
23	165 55.0	12.8
24	180 55.2	+ 4 11.8
code	—	− 10

STARS No.	SHA ° ′	Dec. ° ′	Transit Mer. Gr. h m
1	358 31.4	+28 49.6	0 49
2	358 20.8	+58 53.1	0 50
3	349 42.1	−18 14.9	1 24
4	339 20.1	+59 59.1	2 05
5	336 00.5	−57 28.6	2 19
6	332 23.6	+89 02.1	2 33
7	328 53.0	+23 14.2	2 47
8	315 53.2	−40 29.4	3 39
9	309 46.8	+49 41.5	4 03
10	291 42.7	+16 25.0	5 15
11	281 56.7	− 8 15.0	5 54
12	281 43.2	+45 57.1	5 55
13	279 21.9	+ 6 18.7	6 05
14	279 11.4	+28 34.2	6 05
15	276 33.5	− 1 13.6	6 16
16	271 51.6	+ 7 24.2	6 35
17	264 17.0	−52 39.6	7 05
18	259 14.8	−16 38.5	7 25
19	255 49.2	−28 53.9	7 39
20	245 48.5	+ 5 21.2	8 19
21	244 24.6	+28 08.8	8 24
22	234 37.7	−59 20.9	9 03
23	223 27.2	−43 13.9	9 48
24	221 50.9	−69 30.8	9 54
25	218 42.0	− 8 26.7	10 07
26	208 33.2	+12 12.4	10 47
27	194 48.8	+62 00.8	11 42
28	183 21.2	+14 50.6	12 28
29	174 02.3	−62 50.0	13 05
30	172 53.6	−56 50.6	13 09
31	168 47.5	−59 25.6	13 26
32	167 01.6	+56 13.4	13 33
33	159 30.4	+55 10.8	14 03
34	159 20.5	−10 54.6	14 03
35	153 35.6	+49 33.4	14 26
36	149 02.8	−36 08.1	14 45
37	146 38.3	+19 26.1	14 54
38	140 56.0	−60 38.6	15 17
39	137 17.9	+74 21.3	15 31
40	126 50.4	+26 52.7	16 13
41	120 37.9	−22 29.3	16 38
42	113 23.4	−26 19.8	17 07
43	109 07.1	−68 56.9	17 24
44	103 05.8	−15 40.1	17 48
45	97 25.0	−37 04.5	18 11
46	96 49.5	+12 35.7	18 13
47	91 07.6	+51 29.8	18 36
48	84 45.3	−34 24.8	19 01
49	81 10.3	+38 44.4	19 15
50	76 55.7	−26 21.7	19 32
51	62 53.3	+ 8 44.4	20 28
52	54 31.7	−56 53.7	21 02
53	50 02.9	+45 06.6	21 19
54	34 32.4	+ 9 39.3	22 21
55	28 41.3	−47 11.8	22 45
56	16 14.7	−29 52.6	23 34
57	14 24.3	+14 56.8	23 42

Lat.	Sunrise	Twlt. begins	Moonrise 10	Moonrise 11	Moonrise 12	Moonrise 13
N °	h m	h m	h m	h m	h m	h m
70	4 53	////	■	■	20 29	19 18
68	4 59	////	■	■	19 40	18 59
66	5 05	1 03	■	20 17	19 09	18 44
64	5 09	1 46	■	19 10	18 45	18 32
62	5 13	2 14	18 47	18 34	18 27	18 21
60	5 16	2 34	17 59	18 08	18 11	18 12
58	5 19	2 50	17 28	17 48	17 58	18 03
56	5 22	3 03	17 04	17 31	17 46	17 56
54	5 24	3 15	16 45	17 16	17 36	17 50
52	5 27	3 24	16 28	17 03	17 27	17 44
50	5 29	3 33	16 14	16 52	17 19	17 39
45	5 33	3 50	15 46	16 29	17 01	17 27
40	5 36	4 02	15 23	16 10	16 47	17 17
35	5 39	4 13	15 04	15 54	16 35	17 09
30	5 42	4 20	14 48	15 40	16 24	17 02
20	5 46	4 32	14 21	15 16	16 06	16 49
10	5 50	4 40	13 57	14 56	15 49	16 38
0	5 54	4 45	13 35	14 37	15 34	16 28
10	5 57	4 48	13 13	14 17	15 19	16 17
20	6 00	4 48	12 50	13 57	15 03	16 06
30	6 04	4 46	12 22	13 33	14 44	15 53
35	6 06	4 44	12 06	13 19	14 33	15 45
40	6 09	4 40	11 47	13 02	14 20	15 37
45	6 12	4 35	11 24	12 42	14 05	15 27
50	6 15	4 29	10 54	12 17	13 46	15 14
52	6 16	4 25	10 40	12 05	13 37	15 09
54	6 18	4 22	10 23	11 52	13 27	15 02
56	6 20	4 17	10 03	11 36	13 16	14 55
58	6 22	4 12	9 37	11 17	13 03	14 47
60	6 24	4 06	9 02	10 53	12 48	14 38
S						

Lat.	Sunset	Twlt. ends	Moonset 10	Moonset 11	Moonset 12	Moonset 13
N °	h m	h m	h m	h m	h m	h m
70	18 58	////	■	■	23 29	26 29
68	18 52	////	■	■	24 16	0 16
66	18 47	22 38	■	21 42	24 46	0 46
64	18 43	21 59	■	22 46	25 08	1 08
62	18 39	21 34	21 01	23 21	25 26	1 26
60	18 36	21 14	21 50	23 46	25 40	1 40
58	18 33	20 59	22 20	24 06	0 06	1 53
56	18 30	20 46	22 43	24 22	0 22	2 03
54	18 28	20 35	23 02	24 36	0 36	2 12
52	18 26	20 26	23 18	24 48	0 48	2 21
50	18 24	20 18	23 32	24 59	0 59	2 28
45	18 20	20 02	24 00	0 00	1 21	2 44
40	18 17	19 50	24 22	0 22	1 39	2 57
35	18 14	19 40	24 40	0 40	1 54	3 08
30	18 11	19 32	24 55	0 55	2 07	3 17
20	18 07	19 21	0 15	1 22	2 28	3 33
10	18 03	19 13	0 40	1 44	2 47	3 47
0	18 00	19 09	1 02	2 05	3 05	4 00
10	17 57	19 07	1 25	2 26	3 22	4 13
20	17 54	19 07	1 49	2 48	3 40	4 27
30	17 50	19 09	2 17	3 13	4 01	4 42
35	17 48	19 12	2 34	3 28	4 13	4 51
40	17 46	19 16	2 53	3 46	4 27	5 01
45	17 43	19 21	3 17	4 06	4 44	5 13
50	17 40	19 28	3 47	4 32	5 04	5 27
52	17 38	19 31	4 01	4 45	5 14	5 34
54	17 37	19 35	4 19	4 59	5 24	5 41
56	17 35	19 40	4 39	5 15	5 36	5 49
58	17 33	19 45	5 05	5 35	5 50	5 58
60	17 31	19 51	5 40	6 00	6 06	6 08
S						

GCT	Equation of Time (App.—Mean) 10	11	12
h	m s	m s	m s
0	+ 2 37.6	+ 2 58.5	+ 3 19.4
6	+ 2 42.8	+ 3 03.7	+ 3 24.7
12	+ 2 48.0	+ 3 08.9	+ 3 30.0
18	+ 2 53.2	+ 3 14.2	+ 3 35.2
24	+ 2 58.5	+ 3 19.4	+ 3 40.5

GCT of Transit Meridian of Greenwich DAY	Moon	Venus	Mars	Jupiter	Saturn
	h m	h m	h m	h m	h m
10	19 50	11 05	9 55	1 34	13 00
11	20 51	10 59	9 54	1 29	12 57
12	21 47	10 54	9 53	1 25	12 53
13	22 40	10 48	9 51	1 21	12 50

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb	Venus	Mars
°	′	′	′
0			
	0.2	0.4	0.1
30			
	0.2	0.4	0.0
45			
	0.2	0.3	0.0
60			
	0.2	0.2	0.0
75			
	0.2	0.1	0.0
90			

Moon's Lower Limb

Add

Alt.	10	11	12
°	′	′	′
0			
	18.9	19.0	19.0
4			
	18.8	19.0	19.0
8			
	18.8	18.9	18.9
12			
	18.8	18.9	18.9
16			
	18.7	18.9	18.9
20			
	18.7	18.8	18.8
24			
	18.6	18.7	18.7
28			
	18.5	18.6	18.6
32			
	18.4	18.5	18.5
36			
	18.3	18.4	18.4
40			
	18.2	18.3	18.3
44			
	18.1	18.2	18.2
48			
	17.9	18.0	18.0
52			
	17.8	17.9	17.9
56			
	17.6	17.7	17.7
60			
	17.5	17.6	17.6
64			
	17.3	17.4	17.4
68			
	17.1	17.2	17.2
72			
	17.0	17.0	17.0
76			
	16.8	16.8	16.8
80			
	16.6	16.7	16.7
84			
	16.4	16.5	16.5
88			
	16.3	16.3	16.3
90			

Add to table, back cover

Moon's Upper Limb

Subtract

Alt.	10	11	12
°	′	′	′
0			
	13.7	13.6	13.6
4			
	13.7	13.6	13.6
8			
	13.7	13.6	13.6
12			
	13.7	13.7	13.7
16			
	13.8	13.7	13.7
20			
	13.8	13.8	13.8
24			
	13.9	13.9	13.9
28			
	14.0	13.9	13.9
32			
	14.1	14.0	14.0
36			
	14.2	14.2	14.2
40			
	14.3	14.3	14.3
44			
	14.5	14.4	14.4
48			
	14.6	14.5	14.5
52			
	14.7	14.7	14.7
56			
	14.9	14.9	14.9
60			
	15.0	15.0	15.0
64			
	15.2	15.2	15.2
68			
	15.4	15.4	15.4
72			
	15.5	15.5	15.5
76			
	15.7	15.7	15.7
80			
	15.9	15.9	15.9
84			
	16.1	16.1	16.1
88			
	16.2	16.2	16.2
90			

Subtract from table, back cover

GCT	♈	VENUS −3.6		MARS 1.9		JUPITER −2.5		SATURN 1.1		MOON			
	GHA	GHA	Dec.	GHA	Dec.	GHA	Dec.	GHA	Dec.	GHA	code	Dec.	code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
0	351 10.7	197 21.2	+ 2 00.3	212 04.2	+17 04.7	339 46.1	+ 3 09.1	167 09.3	+ 0 35.6	31 58.1	85	−18 03.4	+137
1	6 13.2	212 24.6	01.0	227 05.1	04.3	354 48.8	09.0	182 11.5	35.5	46 25.6	86	17 49.7	+139
2	21 15.6	227 28.1	01.6	242 06.0	03.8	9 51.5	08.9	197 13.7	35.4	60 53.2	87	17 35.8	+139
3	36 18.1	242 31.5	·· 02.3	257 06.9	·· 03.4	24 54.3	·· 08.8	212 15.9	·· 35.2	75 20.9	88	·17 21.9	+141
4	51 20.6	257 34.9	03.0	272 07.8	02.9	39 57.0	08.6	227 18.1	35.1	89 48.7	89	17 07.8	+141
5	66 23.0	272 38.4	03.6	287 08.6	02.4	54 59.7	08.5	242 20.2	35.0	104 16.6	89	16 53.7	+143
6	81 25.5	287 41.8	+ 2 04.3	302 09.5	+17 02.0	70 02.4	+ 3 08.4	257 22.4	+ 0 34.9	118 44.5	91	−16 39.4	+143
7	96 28.0	302 45.2	05.0	317 10.4	01.5	85 05.2	08.3	272 24.6	34.8	133 12.6	92	16 25.1	+144
8	111 30.4	317 48.6	05.6	332 11.3	01.1	100 07.9	08.2	287 26.8	34.6	147 40.8	92	16 10.7	+145
9	126 32.9	332 52.0	·· 06.3	347 12.2	·· 00.6	115 10.6	·· 08.1	302 29.0	·· 34.5	162 09.0	94	·15 56.2	+146
10	141 35.4	347 55.4	06.9	2 13.1	17 00.1	130 13.4	07.9	317 31.2	34.4	176 37.4	94	15 41.6	+147
11	156 37.8	2 58.8	07.6	17 14.0	16 59.7	145 16.1	07.8	332 33.4	34.3	191 05.8	96	15 26.9	+147
12	171 40.3	18 02.2	+ 2 08.3	32 14.9	+16 59.2	160 18.8	+ 3 07.7	347 35.5	+ 0 34.2	205 34.4	96	−15 12.2	+149
13	186 42.7	33 05.6	08.9	47 15.8	58.8	175 21.5	07.6	2 37.7	34.0	220 03.0	97	14 57.3	+149
14	201 45.2	48 09.0	09.6	62 16.7	58.3	190 24.3	07.5	17 39.9	33.9	234 31.7	98	14 42.4	+150
15	216 47.7	63 12.4	·· 10.2	77 17.6	·· 57.8	205 27.0	·· 07.4	32 42.1	·· 33.8	249 00.5	99	·14 27.4	+150
16	231 50.1	78 15.8	10.9	92 18.4	57.4	220 29.7	07.2	47 44.3	33.7	263 29.4	100	14 12.4	+151
17	246 52.6	93 19.2	11.6	107 19.3	56.9	235 32.5	07.1	62 46.5	33.6	277 58.4	101	13 57.3	+153
18	261 55.1	108 22.6	+ 2 12.2	122 20.2	+16 56.5	250 35.2	+ 3 07.0	77 48.7	+ 0 33.4	292 27.5	102	−13 42.0	+152
19	276 57.5	123 25.9	12.9	137 21.1	56.0	265 37.9	06.9	92 50.9	33.3	306 56.7	102	13 26.8	+154
20	292 00.0	138 29.3	13.5	152 22.0	55.5	280 40.6	06.8	107 53.0	33.2	321 25.9	103	13 11.4	+154
21	307 02.5	153 32.7	·· 14.2	167 22.9	·· 55.1	295 43.4	·· 06.6	122 55.2	·· 33.1	335 55.2	104	·12 56.0	+154
22	322 04.9	168 36.0	14.9	182 23.8	54.6	310 46.1	06.5	137 57.4	32.9	350 24.6	105	12 40.6	+156
23	337 07.4	183 39.4	15.5	197 24.7	54.2	325 48.8	06.4	152 59.6	32.8	4 54.1	106	12 25.0	+155
0	352 09.9	198 42.8	+ 2 16.2	212 25.6	+16 53.7	340 51.6	+ 3 06.3	168 01.8	+ 0 32.7	19 23.7	106	−12 09.5	+157
1	7 12.3	213 46.1	16.8	227 26.5	53.2	355 54.3	06.2	183 04.0	32.6	33 53.3	107	11 53.8	+157
2	22 14.8	228 49.5	17.5	242 27.4	52.8	10 57.0	06.0	198 06.2	32.5	48 23.0	108	11 38.1	+157
3	37 17.2	243 52.8	·· 18.1	257 28.3	·· 52.3	25 59.8	·· 05.9	213 08.3	·· 32.3	62 52.8	109	·11 22.4	+158
4	52 19.7	258 56.2	18.8	272 29.2	51.8	41 02.5	05.8	228 10.5	32.2	77 22.7	110	11 06.6	+159
5	67 22.2	273 59.5	19.5	287 30.1	51.4	56 05.2	05.7	243 12.7	32.1	91 52.7	110	10 50.7	+159
6	82 24.6	289 02.8	+ 2 20.1	302 31.0	+16 50.9	71 07.9	+ 3 05.6	258 14.9	+ 0 32.0	106 22.7	111	−10 34.8	+159
7	97 27.1	304 06.2	20.8	317 31.8	50.5	86 10.7	05.5	273 17.1	31.9	120 52.8	112	10 18.9	+160
8	112 29.6	319 09.5	21.4	332 32.7	50.0	101 13.4	05.3	288 19.3	31.7	135 23.0	112	10 02.9	+161
9	127 32.0	334 12.8	·· 22.1	347 33.6	·· 49.5	116 16.1	·· 05.2	303 21.5	·· 31.6	149 53.2	114	· 9 46.8	+160
10	142 34.5	349 16.2	22.7	2 34.5	49.1	131 18.9	05.1	318 23.6	31.5	164 23.6	113	9 30.8	+162
11	157 37.0	4 19.5	23.4	17 35.4	48.6	146 21.6	05.0	333 25.8	31.4	178 53.9	115	9 14.6	+161
12	172 39.4	19 22.8	+ 2 24.1	32 36.3	+16 48.1	161 24.3	+ 3 04.9	348 28.0	+ 0 31.2	193 24.4	115	− 8 58.5	+162
13	187 41.9	34 26.1	24.7	47 37.2	47.7	176 27.1	04.7	3 30.2	31.1	207 54.9	116	8 42.3	+162
14	202 44.3	49 29.4	25.4	62 38.1	47.2	191 29.8	04.6	18 32.4	31.0	222 25.5	116	8 26.1	+163
15	217 46.8	64 32.7	·· 26.0	77 39.0	·· 46.8	206 32.5	·· 04.5	33 34.6	·· 30.9	236 56.1	118	· 8 09.8	+163
16	232 49.3	79 36.0	26.7	92 39.9	46.3	221 35.3	04.4	48 36.8	30.8	251 26.9	117	7 53.5	+163
17	247 51.7	94 39.3	27.3	107 40.8	45.8	236 38.0	04.3	63 38.9	30.6	265 57.6	119	7 37.2	+163
18	262 54.2	109 42.6	+ 2 28.0	122 41.7	+16 45.4	251 40.7	+ 3 04.1	78 41.1	+ 0 30.5	280 28.5	119	− 7 20.9	+164
19	277 56.7	124 45.9	28.6	137 42.6	44.9	266 43.5	04.0	93 43.3	30.4	294 59.4	119	7 04.5	+164
20	292 59.1	139 49.2	29.3	152 43.5	44.4	281 46.2	03.9	108 45.5	30.3	309 30.3	120	6 48.1	+164
21	308 01.6	154 52.4	·· 29.9	167 44.4	·· 44.0	296 48.9	·· 03.8	123 47.7	·· 30.2	324 01.3	121	· 6 31.7	+165
22	323 04.1	169 55.7	30.6	182 45.3	43.5	311 51.7	03.7	138 49.9	30.0	338 32.4	121	6 15.2	+164
23	338 06.5	184 59.0	31.2	197 46.2	43.0	326 54.4	03.5	153 52.1	29.9	353 03.5	122	5 58.8	+165
0	353 09.0	200 02.3	+ 2 31.9	212 47.1	+16 42.6	341 57.1	+ 3 03.4	168 54.2	+ 0 29.8	7 34.7	122	− 5 42.3	+165
1	8 11.5	215 05.5	32.5	227 48.0	42.1	356 59.9	03.3	183 56.4	29.7	22 05.9	123	5 25.8	+165
2	23 13.9	230 08.8	33.2	242 48.9	41.6	12 02.6	03.2	198 58.6	29.5	36 37.2	123	5 09.3	+165
3	38 16.4	245 12.1	·· 33.8	257 49.8	·· 41.2	27 05.3	·· 03.1	214 00.8	·· 29.4	51 08.5	124	· 4 52.8	+165
4	53 18.8	260 15.3	34.5	272 50.7	40.7	42 08.1	02.9	229 03.0	29.3	65 39.9	124	4 36.3	+166
5	68 21.3	275 18.6	35.1	287 51.6	40.2	57 10.8	02.8	244 05.2	29.2	80 11.3	125	4 19.7	+165
6	83 23.8	290 21.8	+ 2 35.8	302 52.5	+16 39.8	72 13.5	+ 3 02.7	259 07.4	+ 0 29.1	94 42.8	125	− 4 03.2	+166
7	98 26.2	305 25.1	36.4	317 53.4	39.3	87 16.3	02.6	274 09.5	28.9	109 14.3	126	3 46.6	+166
8	113 28.7	320 28.3	37.1	332 54.3	38.8	102 19.0	02.5	289 11.7	28.8	123 45.9	126	3 30.0	+165
9	128 31.2	335 31.5	·· 37.7	347 55.2	·· 38.4	117 21.7	·· 02.3	304 13.9	·· 28.7	138 17.5	127	· 3 13.5	+166
10	143 33.6	350 34.8	38.4	2 56.1	37.9	132 24.5	02.2	319 16.1	28.6	152 49.2	126	2 56.9	+165
11	158 36.1	5 38.0	39.0	17 57.0	37.4	147 27.2	02.1	334 18.3	28.5	167 20.8	128	2 40.4	+166
12	173 38.6	20 41.2	+ 2 39.7	32 57.9	+16 37.0	162 30.0	+ 3 02.0	349 20.5	+ 0 28.3	181 52.6	127	− 2 23.8	+166
13	188 41.0	35 44.4	40.3	47 58.8	36.5	177 32.7	01.8	4 22.6	28.2	196 24.3	128	2 07.2	+165
14	203 43.5	50 47.7	41.0	62 59.7	36.0	192 35.4	01.7	19 24.8	28.1	210 56.1	129	1 50.7	+166
15	218 46.0	65 50.9	·· 41.6	78 00.6	·· 35.6	207 38.2	·· 01.6	34 27.0	·· 28.0	225 28.0	129	· 1 34.1	+165
16	233 48.4	80 54.1	42.3	93 01.5	35.1	222 40.9	01.5	49 29.2	27.9	239 59.9	129	1 17.6	+166
17	248 50.9	95 57.3	42.9	108 02.4	34.6	237 43.6	01.4	64 31.4	27.7	254 31.8	129	1 01.0	+165
18	263 53.3	111 00.5	+ 2 43.6	123 03.3	+16 34.2	252 46.4	+ 3 01.2	79 33.6	+ 0 27.6	269 03.7	130	− 0 44.5	+165
19	278 55.8	126 03.7	44.2	138 04.2	33.7	267 49.1	01.1	94 35.8	27.5	283 35.7	130	0 28.0	+165
20	293 58.3	141 06.9	44.8	153 05.1	33.2	282 51.8	01.0	109 37.9	27.4	298 07.7	130	− 0 11.5	+165
21	309 00.7	156 10.1	·· 45.5	168 06.0	·· 32.8	297 54.6	·· 00.9	124 40.1	·· 27.2	312 39.7	131	+ 0 05.0	+165
22	324 03.2	171 13.3	46.1	183 06.9	32.3	312 57.3	00.8	139 42.3	27.1	327 11.8	130	0 21.5	+164
23	339 05.7	186 16.4	46.8	198 07.8	31.8	328 00.1	00.6	154 44.5	27.0	341 43.8	132	0 37.9	+165
24	354 08.1	201 19.6	+ 2 47.4	213 08.7	+16 31.3	343 02.8	+ 3 00.5	169 46.7	+ 0 26.9	356 16.0	131	+ 0 54.4	+164
code	—	+ 33	+ 6	+ 9	− 4	+ 28	− 2	+ 22	− 1				

GCT h	SUN GHA ° ′	SUN Dec. ° ′
0	180 55.2	+ 4 11.8
1	195 55.5	10.9
2	210 55.7	09.9
3	225 55.9 ••	09.0
4	240 56.1	08.0
5	255 56.3	07.0
6	270 56.6	+ 4 06.1
7	285 56.8	05.1
8	300 57.0	04.2
9	315 57.2 ••	03.2
10	330 57.5	02.3
11	345 57.7	01.3
12	0 57.9	+ 4 00.4
13	15 58.1	3 59.4
14	30 58.3	58.5
15	45 58.6 ••	57.5
16	60 58.8	56.5
17	75 59.0	55.6
18	90 59.2	+ 3 54.6
19	105 59.4	53.7
20	120 59.7	52.7
21	135 59.9 ••	51.8
22	151 00.1	50.8
23	166 00.3	49.8
0	181 00.5	+ 3 48.9
1	196 00.8	47.9
2	211 01.0	47.0
3	226 01.2 ••	46.0
4	241 01.4	45.1
5	256 01.7	44.1
6	271 01.9	+ 3 43.1
7	286 02.1	42.2
8	301 02.3	41.2
9	316 02.5 ••	40.3
10	331 02.8	39.3
11	346 03.0	38.4
12	1 03.2	+ 3 37.4
13	16 03.4	36.4
14	31 03.7	35.5
15	46 03.9 ••	34.5
16	61 04.1	33.6
17	76 04.3	32.6
18	91 04.5	+ 3 31.6
19	106 04.8	30.7
20	121 05.0	29.7
21	136 05.2 ••	28.8
22	151 05.4	27.8
23	166 05.6	26.9
0	181 05.9	+ 3 25.9
1	196 06.1	24.9
2	211 06.3	24.0
3	226 06.5 ••	23.0
4	241 06.8	22.1
5	256 07.0	21.1
6	271 07.2	+ 3 20.1
7	286 07.4	19.2
8	301 07.6	18.2
9	316 07.9 ••	17.3
10	331 08.1	16.3
11	346 08.3	15.3
12	1 08.5	+ 3 14.4
13	16 08.8	13.4
14	31 09.0	12.4
15	46 09.2 ••	11.5
16	61 09.4	10.5
17	76 09.7	09.6
18	91 09.9	+ 3 08.6
19	106 10.1	07.6
20	121 10.3	06.7
21	136 10.5 ••	05.7
22	151 10.8	04.8
23	166 11.0	03.8
24	181 11.2	+ 3 02.8
code	—	− 10

STARS No.	SHA ° ′	Dec. ° ′	Transit Mer. Gr. h m
1	358 31.4	+28 49.6	0 37
2	358 20.8	+58 53.1	0 38
3	349 42.1	−18 14.9	1 12
4	339 20.0	+59 59.1	1 54
5	336 00.5	−57 28.6	2 07
6	332 22.9	+89 02.2	2 21
7	328 53.0	+23 14.3	2 35
8	315 53.2	−40 29.4	3 27
9	309 46.8	+49 41.5	3 52
10	291 42.7	+16 25.0	5 04
11	281 56.7	− 8 15.0	5 43
12	281 43.1	+45 57.1	5 44
13	279 21.8	+ 6 18.7	5 53
14	279 11.4	+28 34.2	5 54
15	276 33.5	− 1 13.6	6 04
16	271 51.6	+ 7 24.2	6 23
17	264 16.9	−52 39.6	6 53
18	259 14.7	−16 38.5	7 13
19	255 49.2	−28 53.9	7 27
20	245 48.5	+ 5 21.2	8 07
21	244 24.6	+28 08.8	8 12
22	234 37.7	−59 20.8	8 51
23	223 27.1	−43 13.9	9 36
24	221 50.8	−69 30.8	9 42
25	218 42.0	− 8 26.7	9 55
26	208 33.2	+12 12.4	10 35
27	194 48.8	+62 00.8	11 30
28	183 21.2	+14 50.6	12 16
29	174 02.3	−62 50.0	12 53
30	172 53.6	−56 50.6	12 58
31	168 47.5	−59 25.6	13 14
32	167 01.6	+56 13.4	13 21
33	159 30.4	+55 10.7	13 51
34	159 20.5	−10 54.6	13 52
35	153 35.6	+49 33.4	14 15
36	149 02.8	−36 08.1	14 33
37	146 38.3	+19 26.1	14 42
38	140 56.0	−60 38.6	15 05
39	137 18.0	+74 21.3	15 20
40	126 50.4	+26 52.7	16 01
41	120 38.0	−22 29.3	16 26
42	113 23.4	−26 19.8	16 55
43	109 07.1	−68 56.9	17 12
44	103 05.8	−15 40.1	17 36
45	97 25.0	−37 04.5	17 59
46	96 49.5	+12 35.7	18 01
47	91 07.6	+51 29.8	18 24
48	84 45.3	−34 24.8	18 49
49	81 10.3	+38 44.4	19 04
50	76 55.7	−26 21.7	19 20
51	62 53.3	+ 8 44.4	20 16
52	54 31.7	−56 53.7	20 50
53	50 02.9	+45 06.6	21 08
54	34 32.4	+ 9 39.3	22 10
55	28 41.3	−47 11.8	22 33
56	16 14.7	−29 52.6	23 23
57	14 24.3	+14 56.8	23 30

Lat.	Sunrise	Twlt. begins	Moonrise 13	Moonrise 14	Moonrise 15	Moonrise 16
N °	h m	h m	h m	h m	h m	h m
70	5 05	////	19 18	18 42	18 13	17 46
68	5 10	0 26	18 59	18 34	18 12	17 52
66	5 14	1 32	18 44	18 27	18 12	17 57
64	5 18	2 05	18 32	18 21	18 11	18 02
62	5 21	2 27	18 21	18 16	18 11	18 06
60	5 24	2 45	18 12	18 11	18 10	18 09
58	5 26	3 00	18 03	18 07	18 10	18 12
56	5 28	3 12	17 56	18 03	18 09	18 15
54	5 30	3 22	17 50	18 00	18 09	18 17
52	5 31	3 31	17 44	17 57	18 09	18 20
50	5 33	3 39	17 39	17 54	18 08	18 22
45	5 36	3 54	17 27	17 49	18 08	18 26
40	5 39	4 06	17 17	17 43	18 07	18 30
35	5 41	4 15	17 09	17 39	18 07	18 33
30	5 44	4 22	17 02	17 35	18 06	18 36
20	5 47	4 33	16 49	17 29	18 06	18 41
10	5 50	4 40	16 38	17 23	18 05	18 46
0	5 53	4 44	16 28	17 17	18 05	18 50
10	5 55	4 46	16 17	17 12	18 04	18 55
20	5 58	4 46	16 06	17 06	18 03	18 59
30	6 00	4 43	15 53	16 59	18 03	19 05
35	6 02	4 40	15 45	16 55	18 03	19 08
40	6 04	4 36	15 37	16 51	18 02	19 12
45	6 06	4 30	15 27	16 46	18 02	19 16
50	6 08	4 22	15 14	16 39	18 01	19 21
52	6 09	4 19	15 09	16 36	18 01	19 23
54	6 10	4 14	15 02	16 33	18 01	19 26
56	6 12	4 09	14 55	16 30	18 00	19 29
58	6 13	4 03	14 47	16 26	18 00	19 32
60	6 15	3 57	14 38	16 21	18 00	19 36
S						

Lat.	Sunset	Twlt. ends	Moonset 13	Moonset 14	Moonset 15	Moonset 16
N °	h m	h m	h m	h m	h m	h m
70	18 44	////	26 29	2 29	4 49	6 57
68	18 39	23 03	0 16	2 46	4 54	6 54
66	18 35	22 10	0 46	2 59	4 59	6 51
64	18 32	21 40	1 08	3 10	5 02	6 49
62	18 29	21 18	1 26	3 20	5 06	6 47
60	18 27	21 01	1 40	3 27	5 09	6 45
58	18 24	20 47	1 53	3 34	5 11	6 44
56	18 22	20 35	2 03	3 40	5 13	6 43
54	18 21	20 26	2 12	3 46	5 15	6 41
52	18 19	20 17	2 21	3 51	5 17	6 40
50	18 17	20 10	2 28	3 55	5 19	6 39
45	18 14	19 55	2 44	4 05	5 22	6 37
40	18 12	19 44	2 57	4 12	5 25	6 36
35	18 10	19 36	3 08	4 19	5 28	6 34
30	18 08	19 28	3 17	4 25	5 30	6 33
20	18 04	19 18	3 33	4 35	5 34	6 30
10	18 02	19 12	3 47	4 44	5 37	6 28
0	17 59	19 08	4 00	4 52	5 40	6 26
10	17 57	19 07	4 13	5 00	5 43	6 24
20	17 54	19 07	4 27	5 08	5 46	6 22
30	17 51	19 11	4 42	5 18	5 50	6 20
35	17 50	19 14	4 51	5 23	5 52	6 19
40	17 48	19 18	5 01	5 29	5 54	6 17
45	17 46	19 24	5 13	5 36	5 57	6 15
50	17 44	19 32	5 27	5 45	6 00	6 13
52	17 43	19 36	5 34	5 49	6 01	6 12
54	17 42	19 41	5 41	5 53	6 03	6 11
56	17 41	19 46	5 49	5 58	6 04	6 10
58	17 40	19 53	5 58	6 03	6 06	6 09
60	17 38	19 59	6 08	6 09	6 08	6 07
S						

GCT h	Equation of Time (App.—Mean) 13 m s	14 m s	15 m s
0	+ 3 40.5	+ 4 01.7	+ 4 23.0
6	+ 3 45.8	+ 4 07.1	+ 4 28.4
12	+ 3 51.1	+ 4 12.4	+ 4 33.7
18	+ 3 56.4	+ 4 17.7	+ 4 39.0
24	+ 4 01.7	+ 4 23.0	+ 4 44.4

GCT of Transit Meridian of Greenwich

DAY	Moon h m	Venus h m	Mars h m	Jupiter h m	Saturn h m
13	22 40	10 48	9 51	1 21	12 50
14	23 29	10 43	9 50	1 16	12 46
15	24 15	10 38	9 48	1 12	12 43
16	0 15	10 33	9 47	1 08	12 39

ADDITIONAL ALTITUDE CORRECTIONS

Alt. °	Sun's Low'r Limb ′	Venus ′	Mars ′
0			
	0.2	0.4	0.1
30			
	0.2	0.4	0.0
45			
	0.2	0.3	0.0
60			
	0.2	0.2	0.0
75			
	0.2	0.1	0.0
90			

Moon's Lower Limb
Add

Alt. °	13 ′	14 ′	15 ′
0			
	18.7	18.2	17.6
4			
	18.7	18.2	17.6
8			
	18.7	18.2	17.6
12			
	18.7	18.2	17.5
16			
	18.6	18.1	17.5
20			
	18.6	18.1	17.5
24			
	18.5	18.0	17.4
28			
	18.4	17.9	17.4
32			
	18.3	17.9	17.3
36			
	18.2	17.8	17.2
40			
	18.1	17.7	17.2
44			
	18.0	17.6	17.1
48			
	17.8	17.5	17.0
52			
	17.7	17.4	16.9
56			
	17.6	17.2	16.8
60			
	17.4	17.1	16.7
64			
	17.2	17.0	16.6
68			
	17.1	16.8	16.5
72			
	16.9	16.7	16.4
76			
	16.8	16.6	16.3
80			
	16.6	16.4	16.2
84			
	16.4	16.3	16.1
88			
	16.3	16.2	16.0
90			

Add to table, back cover

Moon's Upper Limb
Subtract

Alt. °	13 ′	14 ′	15 ′
0			
	13.7	14.0	14.4
4			
	13.7	14.0	14.4
8			
	13.8	14.1	14.4
12			
	13.8	14.1	14.4
16			
	13.9	14.1	14.5
20			
	13.9	14.2	14.5
24			
	14.0	14.2	14.5
28			
	14.1	14.3	14.6
32			
	14.2	14.4	14.7
36			
	14.3	14.5	14.7
40			
	14.4	14.6	14.8
44			
	14.5	14.7	14.9
48			
	14.6	14.8	15.0
52			
	14.8	14.9	15.0
56			
	14.9	15.0	15.1
60			
	15.1	15.1	15.2
64			
	15.2	15.3	15.3
68			
	15.4	15.4	15.4
72			
	15.5	15.5	15.5
76			
	15.7	15.7	15.7
80			
	15.9	15.8	15.8
84			
	16.1	16.0	15.9
88			
	16.2	16.1	16.0
90			

Subtract from table, back cover

Full Moon 15

GCT	♈ GHA	VENUS −3.7 GHA	VENUS Dec.	MARS 1.9 GHA	MARS Dec.	JUPITER −2.5 GHA	JUPITER Dec.	SATURN 1.1 GHA	SATURN Dec.	MOON GHA	code	MOON Dec.	code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
0	354 08.1	201 19.6	+ 2 47.4	213 08.7	+16 31.3	343 02.8	+ 3 00.5	169 46.7	+ 0 26.9	356 16.0	131	+ 0 54.4	+164
1	9 10.6	216 22.8	48.0	228 09.6	30.9	358 05.5	00.4	184 48.9	26.8	10 48.1	131	1 10.8	+164
2	24 13.1	231 26.0	48.7	243 10.5	30.4	13 08.3	00.3	199 51.0	26.6	25 20.2	132	1 27.2	+164
3	39 15.5	246 29.1	49.3	258 11.4	29.9	28 11.0	00.1	214 53.2	26.5	39 52.4	132	1 43.6	+163
4	54 18.0	261 32.3	50.0	273 12.3	29.5	43 13.8	3 00.0	229 55.4	26.4	54 24.6	132	1 59.9	+163
5	69 20.4	276 35.5	50.6	288 13.2	29.0	58 16.5	2 59.9	244 57.6	26.3	68 56.8	133	2 16.2	+163
6	84 22.9	291 38.6	+ 2 51.2	303 14.1	+16 28.5	73 19.2	+ 2 59.8	259 59.8	+ 0 26.2	83 29.1	132	+ 2 32.5	+163
7	99 25.4	306 41.8	51.9	318 15.0	28.1	88 22.0	59.7	275 02.0	26.0	98 01.3	133	2 48.8	+162
8	114 27.8	321 44.9	52.5	333 15.9	27.6	103 24.7	59.5	290 04.2	25.9	112 33.6	133	3 05.0	+163
9	129 30.3	336 48.1	53.2	348 16.8	27.1	118 27.5	59.4	305 06.3	25.8	127 05.9	133	3 21.3	+161
10	144 32.8	351 51.2	53.8	3 17.7	26.6	133 30.2	59.3	320 08.5	25.7	141 38.2	133	3 37.4	+162
11	159 35.2	6 54.3	54.4	18 18.6	26.2	148 32.9	59.2	335 10.7	25.5	156 10.5	133	3 53.6	+161
12	174 37.7	21 57.5	+ 2 55.1	33 19.5	+16 25.7	163 35.7	+ 2 59.0	350 12.9	+ 0 25.4	170 42.8	133	+ 4 09.7	+161
13	189 40.2	37 00.6	55.7	48 20.4	25.2	178 38.4	58.9	5 15.1	25.3	185 15.1	134	4 25.8	+160
14	204 42.6	52 03.7	56.3	63 21.3	24.8	193 41.2	58.8	20 17.3	25.2	199 47.5	133	4 41.8	+160
15	219 45.1	67 06.8	57.0	78 22.2	24.3	208 43.9	58.7	35 19.4	25.1	214 19.8	134	4 57.8	+160
16	234 47.6	82 09.9	57.6	93 23.1	23.8	223 46.6	58.6	50 21.6	24.9	228 52.2	133	5 13.8	+159
17	249 50.0	97 13.1	58.2	108 24.0	23.3	238 49.4	58.4	65 23.8	24.8	243 24.5	134	5 29.7	+159
18	264 52.5	112 16.2	+ 2 58.9	123 24.9	+16 22.9	253 52.1	+ 2 58.3	80 26.0	+ 0 24.7	257 56.9	134	+ 5 45.6	+158
19	279 54.9	127 19.3	2 59.5	138 25.9	22.4	268 54.9	58.2	95 28.2	24.6	272 29.3	134	6 01.4	+158
20	294 57.4	142 22.4	3 00.1	153 26.8	21.9	283 57.6	58.1	110 30.4	24.5	287 01.7	133	6 17.2	+157
21	309 59.9	157 25.5	00.7	168 27.7	21.4	299 00.3	57.9	125 32.6	24.3	301 34.0	134	6 32.9	+157
22	325 02.3	172 28.6	01.4	183 28.6	21.0	314 03.1	57.8	140 34.7	24.2	316 06.4	134	6 48.6	+157
23	340 04.8	187 31.6	02.0	198 29.5	20.5	329 05.8	57.7	155 36.9	24.1	330 38.8	134	7 04.3	+156
0	355 07.3	202 34.7	+ 3 02.6	213 30.4	+16 20.0	344 08.6	+ 2 57.6	170 39.1	+ 0 24.0	345 11.2	133	+ 7 19.9	+155
1	10 09.7	217 37.8	03.3	228 31.3	19.6	359 11.3	57.5	185 41.3	23.8	359 43.5	134	7 35.4	+155
2	25 12.2	232 40.9	03.9	243 32.2	19.1	14 14.0	57.3	200 43.5	23.7	14 15.9	134	7 50.9	+155
3	40 14.7	247 44.0	04.5	258 33.1	18.6	29 16.8	57.2	215 45.7	23.6	28 48.3	133	8 06.4	+153
4	55 17.1	262 47.0	05.1	273 34.0	18.1	44 19.5	57.1	230 47.8	23.5	43 20.6	134	8 21.7	+154
5	70 19.6	277 50.1	05.8	288 34.9	17.7	59 22.3	57.0	245 50.0	23.4	57 53.0	133	8 37.1	+153
6	85 22.0	292 53.2	+ 3 06.4	303 35.8	+16 17.2	74 25.0	+ 2 56.8	260 52.2	+ 0 23.2	72 25.3	134	+ 8 52.4	+152
7	100 24.5	307 56.2	07.0	318 36.7	16.7	89 27.8	56.7	275 54.4	23.1	86 57.7	133	9 07.6	+152
8	115 27.0	322 59.3	07.6	333 37.6	16.2	104 30.5	56.6	290 56.6	23.0	101 30.0	133	9 22.8	+151
9	130 29.4	338 02.3	08.3	348 38.6	15.8	119 33.2	56.5	305 58.8	22.9	116 02.3	133	9 37.9	+150
10	145 31.9	353 05.4	08.9	3 39.5	15.3	134 36.0	56.3	321 00.9	22.7	130 34.6	133	9 52.9	+150
11	160 34.4	8 08.4	09.5	18 40.4	14.8	149 38.7	56.2	336 03.1	22.6	145 06.9	133	10 07.9	+149
12	175 36.8	23 11.4	+ 3 10.1	33 41.3	+16 14.3	164 41.5	+ 2 56.1	351 05.3	+ 0 22.5	159 39.2	133	+10 22.8	+149
13	190 39.3	38 14.5	10.7	48 42.2	13.9	179 44.2	56.0	6 07.5	22.4	174 11.5	132	10 37.7	+147
14	205 41.8	53 17.5	11.4	63 43.1	13.4	194 47.0	55.8	21 09.7	22.3	188 43.7	133	10 52.4	+148
15	220 44.2	68 20.5	12.0	78 44.0	12.9	209 49.7	55.7	36 11.9	22.1	203 16.0	132	11 07.2	+146
16	235 46.7	83 23.5	12.6	93 44.9	12.4	224 52.5	55.6	51 14.0	22.0	217 48.2	132	11 21.8	+146
17	250 49.2	98 26.6	13.2	108 45.8	12.0	239 55.2	55.5	66 16.2	21.9	232 20.4	132	11 36.4	+145
18	265 51.6	113 29.6	+ 3 13.8	123 46.7	+16 11.5	254 57.9	+ 2 55.3	81 18.4	+ 0 21.8	246 52.6	132	+11 50.9	+145
19	280 54.1	128 32.6	14.4	138 47.6	11.0	270 00.7	55.2	96 20.6	21.7	261 24.8	131	12 05.4	+144
20	295 56.5	143 35.6	15.0	153 48.5	10.5	285 03.4	55.1	111 22.8	21.5	275 56.9	132	12 19.8	+143
21	310 59.0	158 38.6	15.7	168 49.5	10.0	300 06.2	55.0	126 25.0	21.4	290 29.1	131	12 34.1	+142
22	326 01.5	173 41.6	16.3	183 50.4	09.6	315 08.9	54.9	141 27.2	21.3	305 01.2	131	12 48.3	+141
23	341 03.9	188 44.6	16.9	198 51.3	09.1	330 11.7	54.7	156 29.3	21.2	319 33.3	130	13 02.4	+141
0	356 06.4	203 47.6	+ 3 17.5	213 52.2	+16 08.6	345 14.4	+ 2 54.6	171 31.5	+ 0 21.0	334 05.3	131	+13 16.5	+140
1	11 08.9	218 50.5	18.1	228 53.1	08.1	0 17.2	54.5	186 33.7	20.9	348 37.4	130	13 30.5	+140
2	26 11.3	233 53.5	18.7	243 54.0	07.7	15 19.9	54.4	201 35.9	20.8	3 09.4	130	13 44.5	+138
3	41 13.8	248 56.5	19.3	258 54.9	07.2	30 22.6	54.2	216 38.1	20.7	17 41.4	129	13 58.3	+138
4	56 16.3	263 59.5	19.9	273 55.8	06.7	45 25.4	54.1	231 40.3	20.6	32 13.3	130	14 12.1	+137
5	71 18.7	279 02.4	20.5	288 56.7	06.2	60 28.1	54.0	246 42.4	20.4	46 45.3	129	14 25.8	+136
6	86 21.2	294 05.4	+ 3 21.2	303 57.7	+16 05.7	75 30.9	+ 2 53.9	261 44.6	+ 0 20.3	61 17.2	129	+14 39.4	+135
7	101 23.7	309 08.4	21.8	318 58.6	05.3	90 33.6	53.7	276 46.8	20.2	75 49.1	128	14 52.9	+135
8	116 26.1	324 11.3	22.4	333 59.5	04.8	105 36.4	53.6	291 49.0	20.1	90 20.9	128	15 06.4	+133
9	131 28.6	339 14.3	23.0	349 00.4	04.3	120 39.1	53.5	306 51.2	20.0	104 52.7	128	15 19.7	+133
10	146 31.0	354 17.2	23.6	4 01.3	03.8	135 41.9	53.4	321 53.4	19.8	119 24.5	128	15 33.0	+132
11	161 33.5	9 20.2	24.2	19 02.2	03.4	150 44.6	53.2	336 55.5	19.7	133 56.3	127	15 46.2	+131
12	176 36.0	24 23.1	+ 3 24.8	34 03.1	+16 02.9	165 47.4	+ 2 53.1	351 57.7	+ 0 19.6	148 28.0	127	+15 59.3	+130
13	191 38.4	39 26.0	25.4	49 04.0	02.4	180 50.1	53.0	6 59.9	19.5	162 59.7	127	16 12.3	+129
14	206 40.9	54 29.0	26.0	64 05.0	01.9	195 52.9	52.9	22 02.1	19.3	177 31.4	127	16 25.2	+128
15	221 43.4	69 31.9	26.6	79 05.9	01.4	210 55.6	52.7	37 04.3	19.2	192 03.1	126	16 38.0	+128
16	236 45.8	84 34.8	27.2	94 06.8	01.0	225 58.4	52.6	52 06.5	19.1	206 34.7	125	16 50.8	+126
17	251 48.3	99 37.7	27.8	109 07.7	00.5	241 01.1	52.5	67 08.6	19.0	221 06.2	126	17 03.4	+126
18	266 50.8	114 40.7	+ 3 28.4	124 08.6	+16 00.0	256 03.9	+ 2 52.4	82 10.8	+ 0 18.9	235 37.8	125	+17 16.0	+125
19	281 53.2	129 43.6	29.0	139 09.5	15 59.5	271 06.6	52.2	97 13.0	18.7	250 09.3	124	17 28.5	+123
20	296 55.7	144 46.5	29.6	154 10.4	59.0	286 09.4	52.1	112 15.2	18.6	264 40.7	125	17 40.8	+123
21	311 58.1	159 49.4	30.2	169 11.4	58.6	301 12.1	52.0	127 17.4	18.5	279 12.2	124	17 53.1	+122
22	327 00.6	174 52.3	30.8	184 12.3	58.1	316 14.8	51.9	142 19.5	18.4	293 43.6	123	18 05.3	+121
23	342 03.1	189 55.2	31.4	199 13.2	57.6	331 17.6	51.7	157 21.7	18.3	308 14.9	123	18 17.4	+120
24	357 05.5	204 58.1	+ 3 31.9	214 14.1	+15 57.1	346 20.3	+ 2 51.6	172 23.9	+ 0 18.1	322 46.2	123	+18 29.4	+119
code	—	+ 31	+ 6	+ 9	− 4	+ 27	− 1	+ 22	− 1				

GCT	SUN GHA	SUN Dec.
h	° ′	° ′
0	181 11.2	+ 3 02.8
1	196 11.4	01.9
2	211 11.7	3 00.9
3	226 11.9	· 2 59.9
4	241 12.1	59.0
5	256 12.3	58.0
6	271 12.5	+ 2 57.1
7	286 12.8	56.1
8	301 13.0	55.1
9	316 13.2	·· 54.2
10	331 13.4	53.2
11	346 13.7	52.2
12	1 13.9	+ 2 51.3
13	16 14.1	50.3
14	31 14.3	49.4
15	46 14.5	·· 48.4
16	61 14.8	47.4
17	76 15.0	46.5
18	91 15.2	+ 2 45.5
19	106 15.4	44.5
20	121 15.7	43.6
21	136 15.9	·· 42.6
22	151 16.1	41.6
23	166 16.3	40.7
0	181 16.6	+ 2 39.7
1	196 16.8	38.8
2	211 17.0	37.8
3	226 17.2	·· 36.8
4	241 17.4	35.9
5	256 17.7	34.9
6	271 17.9	+ 2 33.9
7	286 18.1	33.0
8	301 18.3	32.0
9	316 18.6	·· 31.0
10	331 18.8	30.1
11	346 19.0	29.1
12	1 19.2	+ 2 28.1
13	16 19.5	27.2
14	31 19.7	26.2
15	46 19.9	·· 25.2
16	61 20.1	24.3
17	76 20.3	23.3
18	91 20.6	+ 2 22.3
19	106 20.8	21.4
20	121 21.0	20.4
21	136 21.2	·· 19.4
22	151 21.5	18.5
23	166 21.7	17.5
0	181 21.9	+ 2 16.6
1	196 22.1	15.6
2	211 22.4	14.6
3	226 22.6	·· 13.7
4	241 22.8	12.7
5	256 23.0	11.7
6	271 23.2	+ 2 10.8
7	286 23.5	09.8
8	301 23.7	08.8
9	316 23.9	·· 07.8
10	331 24.1	06.9
11	346 24.4	05.9
12	1 24.6	+ 2 04.9
13	16 24.8	04.0
14	31 25.0	03.0
15	46 25.2	·· 02.0
16	61 25.5	01.1
17	76 25.7	2 00.1
18	91 25.9	+ 1 59.1
19	106 26.1	58.2
20	121 26.4	57.2
21	136 26.6	·· 56.2
22	151 26.8	55.3
23	166 27.0	54.3
24	181 27.3	+ 1 53.3
code	—	− 9

STARS No.	SHA	Dec.	Transit Mer. Gr.
	° ′	° ′	h m
1	358 31.3	+28 49.6	0 25
2	358 20.7	+58 53.1	0 26
3	349 42.0	−18 14.9	1 01
4	339 20.0	+59 59.1	1 42
5	336 00.4	−57 28.6	1 55
6	332 22.3	+89 02.2	2 10
7	328 53.0	+23 14.3	2 24
8	315 53.1	−40 29.4	3 15
9	309 46.8	+49 41.5	3 40
10	291 42.6	+16 25.0	4 52
11	281 56.6	− 8 15.0	5 31
12	281 43.1	+45 57.1	5 32
13	279 21.8	+ 6 18.7	5 41
14	279 11.3	+28 34.2	5 42
15	276 33.5	− 1 13.6	5 52
16	271 51.6	+ 7 24.2	6 11
17	264 16.9	−52 39.6	6 41
18	259 14.7	−16 38.5	7 01
19	255 49.2	−28 53.9	7 15
20	245 48.4	+ 5 21.2	7 55
21	244 24.6	+28 08.8	8 01
22	234 37.7	−59 20.8	8 40
23	223 27.1	−43 13.9	9 24
24	221 50.8	−69 30.8	9 31
25	218 42.0	− 8 26.7	9 43
26	208 33.1	+12 12.4	10 24
27	194 48.8	+62 00.7	11 18
28	183 21.2	+14 50.6	12 04
29	174 02.4	−62 50.0	12 41
30	172 53.6	−56 50.6	12 46
31	168 47.5	−59 25.6	13 02
32	167 01.6	+56 13.4	13 09
33	159 30.5	+55 10.7	13 39
34	159 20.5	−10 54.6	13 40
35	153 35.6	+49 33.3	14 03
36	149 02.8	−36 08.1	14 21
37	146 38.3	+19 26.1	14 31
38	140 56.0	−60 38.6	14 53
39	137 18.0	+74 21.3	15 08
40	126 50.4	+26 52.7	15 50
41	120 38.0	−22 29.3	16 14
42	113 23.4	−26 19.8	16 43
43	109 07.1	−68 56.9	17 00
44	103 05.9	−15 40.1	17 24
45	97 25.0	−37 04.5	17 47
46	96 49.5	+12 35.7	17 49
47	91 07.7	+51 29.8	18 12
48	84 45.3	−34 24.8	18 37
49	81 10.3	+38 44.4	18 52
50	76 55.7	−26 21.7	19 09
51	62 53.4	+ 8 44.4	20 05
52	54 31.7	−56 53.7	20 38
53	50 02.9	+45 06.6	20 56
54	34 32.4	+ 9 39.3	21 58
55	28 41.3	−47 11.8	22 21
56	16 14.7	−29 52.6	23 11
57	14 24.3	+14 56.9	23 18

Lat.	Sunrise	Twlt. begins	Moonrise 16	Moonrise 17	Moonrise 18	Moonrise 19
N °	h m	h m	h m	h m	h m	h m
70	5 17	////	17 46	17 15	16 30	▭
68	5 21	1 12	17 52	17 30	17 00	15 58
66	5 24	1 54	17 57	17 42	17 23	16 53
64	5 26	2 20	18 02	17 52	17 41	17 26
62	5 29	2 40	18 06	18 01	17 56	17 50
60	5 31	2 56	18 09	18 08	18 09	18 10
58	5 32	3 09	18 12	18 15	18 19	18 26
56	5 34	3 20	18 15	18 21	18 29	18 40
54	5 35	3 29	18 17	18 27	18 38	18 52
52	5 36	3 37	18 20	18 31	18 45	19 02
50	5 38	3 44	18 22	18 36	18 52	19 12
45	5 40	3 59	18 26	18 46	19 07	19 32
40	5 42	4 09	18 30	18 54	19 19	19 48
35	5 44	4 18	18 33	19 01	19 30	20 02
30	5 45	4 25	18 36	19 07	19 39	20 14
20	5 48	4 33	18 41	19 18	19 55	20 35
10	5 50	4 40	18 46	19 27	20 09	20 53
0	5 52	4 43	18 50	19 36	20 23	21 11
10	5 53	4 44	18 55	19 45	20 36	21 28
20	5 55	4 43	18 59	19 55	20 50	21 46
30	5 57	4 38	19 05	20 06	21 07	22 08
35	5 58	4 35	19 08	20 13	21 17	22 20
40	5 59	4 31	19 12	20 20	21 28	22 35
45	6 00	4 24	19 16	20 29	21 41	22 53
50	6 02	4 16	19 21	20 39	21 58	23 14
52	6 02	4 10	19 23	20 44	22 05	23 25
54	6 03	4 06	19 26	20 50	22 14	23 36
56	6 04	4 00	19 29	20 56	22 23	23 50
58	6 05	3 53	19 32	21 03	22 34	24 06
60	6 05	3 46	19 36	21 11	22 47	24 25
S						

Lat.	Sunset	Twlt. ends	Moonset 16	Moonset 17	Moonset 18	Moonset 19
N °	h m	h m	h m	h m	h m	h m
70	18 30	////	6 57	9 06	11 29	▭
68	18 27	22 25	6 54	8 53	11 00	13 41
66	18 24	21 47	6 51	8 43	10 39	12 48
64	18 21	21 22	6 49	8 34	10 22	12 16
62	18 19	21 03	6 47	8 27	10 08	11 52
60	18 17	20 48	6 45	8 21	9 56	11 33
58	18 16	20 36	6 44	8 15	9 46	11 18
56	18 14	20 25	6 43	8 10	9 37	11 05
54	18 13	20 17	6 41	8 06	9 30	10 53
52	18 12	20 09	6 40	8 02	9 23	10 43
50	18 11	20 02	6 39	7 58	9 17	10 34
45	18 09	19 49	6 37	7 51	9 04	10 15
40	18 07	19 39	6 36	7 45	8 53	10 00
35	18 05	19 30	6 34	7 39	8 44	9 47
30	18 04	19 24	6 33	7 34	8 35	9 36
20	18 02	19 15	6 30	7 26	8 21	9 17
10	18 00	19 10	6 28	7 19	8 09	9 01
0	17 58	19 07	6 26	7 12	7 58	8 45
10	17 56	19 06	6 24	7 05	7 47	8 30
20	17 55	19 08	6 22	6 58	7 35	8 14
30	17 53	19 13	6 20	6 50	7 21	7 55
35	17 52	19 16	6 19	6 45	7 14	7 44
40	17 51	19 21	6 17	6 40	7 05	7 32
45	17 50	19 28	6 15	6 34	6 54	7 17
50	17 49	19 38	6 13	6 27	6 42	7 00
52	17 48	19 42	6 12	6 24	6 36	6 51
54	17 48	19 48	6 11	6 20	6 30	6 42
56	17 47	19 53	6 10	6 16	6 23	6 32
58	17 46	20 00	6 09	6 11	6 15	6 20
60	17 45	20 08	6 07	6 06	6 06	6 06
S						

GCT	Equation of Time (App.—Mean) 16	17	18
h	m s	m s	m s
0	+ 4 44.4	+ 5 05.8	+ 5 27.2
6	+ 4 49.7	+ 5 11.1	+ 5 32.5
12	+ 4 55.1	+ 5 16.5	+ 5 37.9
18	+ 5 00.4	+ 5 21.8	+ 5 43.2
24	+ 5 05.8	+ 5 27.2	+ 5 48.6

GCT of Transit Meridian of Greenwich

DAY	Moon	Venus	Mars	Jupiter	Saturn
	h m	h m	h m	h m	h m
16	0 15	10 33	9 47	1 08	12 39
17	1 01	10 28	9 45	1 03	12 36
18	1 47	10 23	9 44	0 59	12 32
19	2 34	10 18	9 43	0 55	12 29

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb	Venus	Mars
°	′	′	′
0			
	0.2	0.4	0.1
30			
	0.2	0.4	0.0
45			
	0.2	0.3	0.0
60			
	0.2	0.2	0.0
75			
	0.2	0.1	0.0
90			

Moon's Lower Limb
Add

Alt.	16	17	18
°	′	′	′
0			
	16.8	15.8	14.9
4			
	16.8	15.8	14.9
8			
	16.8	15.8	14.9
12			
	16.8	15.8	14.9
16			
	16.8	15.8	14.9
20			
	16.8	15.8	15.0
24			
	16.7	15.8	15.0
28			
	16.7	15.8	15.0
32			
	16.7	15.8	15.0
36			
	16.6	15.8	15.0
40			
	16.6	15.8	15.0
44			
	16.5	15.7	15.1
48			
	16.5	15.7	15.1
52			
	16.4	15.7	15.1
56			
	16.4	15.7	15.1
60			
	16.3	15.7	15.2
64			
	16.2	15.7	15.2
68			
	16.2	15.7	15.2
72			
	16.1	15.7	15.3
76			
	16.0	15.6	15.3
80			
	16.0	15.6	15.3
84			
	15.9	15.6	15.4
88			
	15.8	15.6	15.4
90			

Add to table, back cover

Moon's Upper Limb
Subtract

Alt.	16	17	18
°	′	′	′
0			
	14.8	15.4	15.9
4			
	14.8	15.4	15.9
8			
	14.8	15.4	15.9
12			
	14.9	15.4	15.9
16			
	14.9	15.4	15.9
20			
	14.9	15.4	15.9
24			
	14.9	15.4	15.9
28			
	15.0	15.4	15.8
32			
	15.0	15.4	15.8
36			
	15.0	15.4	15.8
40			
	15.1	15.5	15.8
44			
	15.1	15.5	15.8
48			
	15.2	15.5	15.7
52			
	15.2	15.5	15.7
56			
	15.3	15.5	15.7
60			
	15.4	15.5	15.6
64			
	15.4	15.5	15.6
68			
	15.5	15.5	15.6
72			
	15.5	15.6	15.6
76			
	15.6	15.6	15.5
80			
	15.7	15.6	15.5
84			
	15.8	15.6	15.4
88			
	15.8	15.6	15.4
90			

Subtract from table, back cover

GCT	♈ GHA	VENUS −3.9 GHA	VENUS Dec.	MARS 1.9 GHA	MARS Dec.	JUPITER −2.5 GHA	JUPITER Dec.	SATURN 1.1 GHA	SATURN Dec.	MOON GHA	code	MOON Dec.	code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
0	357 05.5	204 58.1	+ 3 31.9	214 14.1	+15 57.1	346 20.3	+ 2 51.6	172 23.9	+ 0 18.1	322 46.2	123	+18 29.4	+119
1	12 08.0	220 00.9	32.5	229 15.0	56.6	1 23.1	51.5	187 26.1	18.0	337 17.5	123	18 41.3	+117
2	27 10.5	235 03.8	33.1	244 15.9	56.2	16 25.8	51.4	202 28.3	17.9	351 48.8	122	18 53.0	+117
3	42 12.9	250 06.7	33.7	259 16.9	55.7	31 28.6	51.2	217 30.5	17.8	6 20.0	121	19 04.7	+116
4	57 15.4	265 09.6	34.3	274 17.8	55.2	46 31.3	51.1	232 32.6	17.6	20 51.1	122	19 16.3	+115
5	72 17.9	280 12.4	34.9	289 18.7	54.7	61 34.1	51.0	247 34.8	17.5	35 22.3	120	19 27.8	+114
6	87 20.3	295 15.3	+ 3 35.5	304 19.6	+15 54.2	76 36.8	+ 2 50.9	262 37.0	+ 0 17.4	49 53.3	121	+19 39.2	+113
7	102 22.8	310 18.2	36.1	319 20.5	53.7	91 39.6	50.7	277 39.2	17.3	64 24.4	120	19 50.5	+112
8	117 25.3	325 21.0	36.7	334 21.4	53.3	106 42.3	50.6	292 41.4	17.2	78 55.4	120	20 01.7	+110
9	132 27.7	340 23.9	37.2	349 22.3	52.8	121 45.1	50.5	307 43.6	17.0	93 26.4	119	20 12.7	+110
10	147 30.2	355 26.7	37.8	4 23.3	52.3	136 47.8	50.3	322 45.7	16.9	107 57.3	119	20 23.7	+109
11	162 32.6	10 29.6	38.4	19 24.2	51.8	151 50.6	50.2	337 47.9	16.8	122 28.2	118	20 34.6	+107
12	177 35.1	25 32.4	+ 3 39.0	34 25.1	+15 51.3	166 53.3	+ 2 50.1	352 50.1	+ 0 16.7	136 59.0	118	+20 45.3	+107
13	192 37.6	40 35.3	39.6	49 26.0	50.8	181 56.1	50.0	7 52.3	16.5	151 29.8	118	20 56.0	+105
14	207 40.0	55 38.1	40.2	64 26.9	50.4	196 58.8	49.8	22 54.5	16.4	166 00.6	117	21 06.5	+104
15	222 42.5	70 40.9	40.7	79 27.9	49.9	212 01.6	49.7	37 56.7	16.3	180 31.3	117	21 16.9	+103
16	237 45.0	85 43.7	41.3	94 28.8	49.4	227 04.3	49.6	52 58.8	16.2	195 02.0	117	21 27.2	+102
17	252 47.4	100 46.6	41.9	109 29.7	48.9	242 07.1	49.5	68 01.0	16.1	209 32.7	116	21 37.4	+101
18	267 49.9	115 49.4	+ 3 42.5	124 30.6	+15 48.4	257 09.9	+ 2 49.3	83 03.2	+ 0 15.9	224 03.3	115	+21 47.5	+100
19	282 52.4	130 52.2	43.0	139 31.5	47.9	272 12.6	49.2	98 05.4	15.8	238 33.8	115	21 57.5	+ 99
20	297 54.8	145 55.0	43.6	154 32.4	47.5	287 15.4	49.1	113 07.6	15.7	253 04.3	115	22 07.4	+ 97
21	312 57.3	160 57.8	44.2	169 33.4	47.0	302 18.1	49.0	128 09.8	15.6	267 34.8	114	22 17.1	+ 97
22	327 59.7	176 00.6	44.8	184 34.3	46.5	317 20.9	48.8	143 11.9	15.5	282 05.2	114	22 26.8	+ 95
23	343 02.2	191 03.4	45.3	199 35.2	46.0	332 23.6	48.7	158 14.1	15.3	296 35.6	114	22 36.3	+ 94
0	358 04.7	206 06.2	+ 3 45.9	214 36.1	+15 45.5	347 26.4	+ 2 48.6	173 16.3	+ 0 15.2	311 06.0	113	+22 45.7	+ 93
1	13 07.1	221 09.0	46.5	229 37.0	45.0	2 29.1	48.5	188 18.5	15.1	325 36.3	113	22 55.0	+ 92
2	28 09.6	236 11.8	47.1	244 38.0	44.6	17 31.9	48.3	203 20.7	15.0	340 06.6	112	23 04.2	+ 90
3	43 12.1	251 14.5	47.6	259 38.9	44.1	32 34.6	48.2	218 22.9	14.8	354 36.8	112	23 13.2	+ 90
4	58 14.5	266 17.3	48.2	274 39.8	43.6	47 37.4	48.1	233 25.0	14.7	9 07.0	111	23 22.2	+ 88
5	73 17.0	281 20.1	48.8	289 40.7	43.1	62 40.1	47.9	248 27.2	14.6	23 37.1	111	23 31.0	+ 87
6	88 19.5	296 22.9	+ 3 49.3	304 41.6	+15 42.6	77 42.9	+ 2 47.8	263 29.4	+ 0 14.5	38 07.2	111	+23 39.7	+ 86
7	103 21.9	311 25.6	49.9	319 42.6	42.1	92 45.6	47.7	278 31.6	14.4	52 37.3	110	23 48.3	+ 84
8	118 24.4	326 28.4	50.5	334 43.5	41.6	107 48.4	47.6	293 33.8	14.2	67 07.3	110	23 56.7	+ 84
9	133 26.9	341 31.1	51.0	349 44.4	41.2	122 51.1	47.4	308 35.9	14.1	81 37.3	109	24 05.1	+ 82
10	148 29.3	356 33.9	51.6	4 45.3	40.7	137 53.9	47.3	323 38.1	14.0	96 07.2	109	24 13.3	+ 81
11	163 31.8	11 36.6	52.1	19 46.2	40.2	152 56.6	47.2	338 40.3	13.9	110 37.1	109	24 21.4	+ 80
12	178 34.2	26 39.4	+ 3 52.7	34 47.2	+15 39.7	167 59.4	+ 2 47.1	353 42.5	+ 0 13.8	125 07.0	108	+24 29.4	+ 78
13	193 36.7	41 42.1	53.3	49 48.1	39.2	183 02.2	46.9	8 44.7	13.6	139 36.8	108	24 37.2	+ 77
14	208 39.2	56 44.8	53.8	64 49.0	38.7	198 04.9	46.8	23 46.9	13.5	154 06.6	108	24 44.9	+ 76
15	223 41.6	71 47.6	54.4	79 49.9	38.2	213 07.7	46.7	38 49.0	13.4	168 36.4	107	24 52.5	+ 75
16	238 44.1	86 50.3	54.9	94 50.9	37.8	228 10.4	46.5	53 51.2	13.3	183 06.1	106	25 00.0	+ 73
17	253 46.6	101 53.0	55.5	109 51.8	37.3	243 13.2	46.4	68 53.4	13.1	197 35.7	107	25 07.3	+ 73
18	268 49.0	116 55.7	+ 3 56.0	124 52.7	+15 36.8	258 15.9	+ 2 46.3	83 55.6	+ 0 13.0	212 05.4	106	+25 14.6	+ 70
19	283 51.5	131 58.5	56.6	139 53.6	36.3	273 18.7	46.2	98 57.8	12.9	226 35.0	105	25 21.6	+ 70
20	298 54.0	147 01.2	57.2	154 54.5	35.8	288 21.4	46.0	114 00.0	12.8	241 04.5	106	25 28.6	+ 68
21	313 56.4	162 03.9	57.7	169 55.5	35.3	303 24.2	45.9	129 02.1	12.7	255 34.1	104	25 35.4	+ 67
22	328 58.9	177 06.6	58.3	184 56.4	34.8	318 26.9	45.8	144 04.3	12.5	270 03.5	105	25 42.1	+ 66
23	344 01.4	192 09.3	58.8	199 57.3	34.3	333 29.7	45.7	159 06.5	12.4	284 33.0	104	25 48.7	+ 65
0	359 03.8	207 12.0	+ 3 59.4	214 58.2	+15 33.8	348 32.5	+ 2 45.5	174 08.7	+ 0 12.3	299 02.4	104	+25 55.2	+ 63
1	14 06.3	222 14.6	3 59.9	229 59.2	33.4	3 35.2	45.4	189 10.9	12.2	313 31.8	104	26 01.5	+ 62
2	29 08.7	237 17.3	4 00.4	245 00.1	32.9	18 38.0	45.3	204 13.0	12.0	328 01.2	103	26 07.7	+ 60
3	44 11.2	252 20.0	01.0	260 01.0	32.4	33 40.7	45.1	219 15.2	11.9	342 30.5	103	26 13.7	+ 59
4	59 13.7	267 22.7	01.5	275 01.9	31.9	48 43.5	45.0	234 17.4	11.8	356 59.8	103	26 19.6	+ 58
5	74 16.1	282 25.4	02.1	290 02.9	31.4	63 46.2	44.9	249 19.6	11.7	11 29.1	102	26 25.4	+ 57
6	89 18.6	297 28.0	+ 4 02.6	305 03.8	+15 30.9	78 49.0	+ 2 44.8	264 21.8	+ 0 11.6	25 58.3	102	+26 31.1	+ 55
7	104 21.1	312 30.7	03.2	320 04.7	30.4	93 51.7	44.6	279 24.0	11.4	40 27.5	102	26 36.6	+ 54
8	119 23.5	327 33.4	03.7	335 05.6	29.9	108 54.5	44.5	294 26.1	11.3	54 56.7	101	26 42.0	+ 53
9	134 26.0	342 36.0	04.2	350 06.6	29.4	123 57.3	44.4	309 28.3	11.2	69 25.8	101	26 47.3	+ 51
10	149 28.5	357 38.7	04.8	5 07.5	29.0	139 00.0	44.2	324 30.5	11.1	83 54.9	101	26 52.4	+ 50
11	164 30.9	12 41.3	05.3	20 08.4	28.5	154 02.8	44.1	339 32.7	10.9	98 24.0	101	26 57.4	+ 49
12	179 33.4	27 44.0	+ 4 05.9	35 09.3	+15 28.0	169 05.5	+ 2 44.0	354 34.9	+ 0 10.8	112 53.1	100	+27 02.3	+ 47
13	194 35.8	42 46.6	06.4	50 10.3	27.5	184 08.3	43.9	9 37.0	10.7	127 22.1	100	27 07.0	+ 46
14	209 38.3	57 49.2	06.9	65 11.2	27.0	199 11.0	43.7	24 39.2	10.6	141 51.1	100	27 11.6	+ 44
15	224 40.8	72 51.9	07.5	80 12.1	26.5	214 13.8	43.6	39 41.4	10.5	156 20.1	100	27 16.0	+ 43
16	239 43.2	87 54.5	08.0	95 13.0	26.0	229 16.6	43.5	54 43.6	10.3	170 49.1	99	27 20.3	+ 42
17	254 45.7	102 57.1	08.5	110 14.0	25.5	244 19.3	43.3	69 45.8	10.2	185 18.0	100	27 24.5	+ 41
18	269 48.2	117 59.7	+ 4 09.1	125 14.9	+15 25.0	259 22.1	+ 2 43.2	84 48.0	+ 0 10.1	199 47.0	99	+27 28.6	+ 39
19	284 50.6	133 02.3	09.6	140 15.8	24.5	274 24.8	43.1	99 50.1	10.0	214 15.9	98	27 32.5	+ 37
20	299 53.1	148 05.0	10.1	155 16.8	24.1	289 27.6	43.0	114 52.3	09.9	228 44.7	99	27 36.2	+ 37
21	314 55.6	163 07.6	10.6	170 17.7	23.6	304 30.3	42.8	129 54.5	09.7	243 13.6	99	27 39.9	+ 35
22	329 58.0	178 10.2	11.2	185 18.6	23.1	319 33.1	42.7	144 56.7	09.6	257 42.5	98	27 43.4	+ 33
23	345 00.5	193 12.8	11.7	200 19.5	22.6	334 35.9	42.6	159 58.9	09.5	272 11.3	98	27 46.7	+ 33
24	0 03.0	208 15.4	+ 4 12.2	215 20.5	+15 22.1	349 38.6	+ 2 42.5	175 01.0	+ 0 09.4	286 40.1	98	+27 50.0	+ 31
code	—	+ 27	+ 6	+ 9	− 5	+ 28	− 2	+ 22	− 2				

GCT	SUN GHA	SUN Dec.
h	° ′	° ′
0	181 27.3	+ 1 53.3
1	196 27.5	52.4
2	211 27.7	51.4
3	226 27.9	·· 50.4
4	241 28.1	49.5
5	256 28.4	48.5
6	271 28.6	+ 1 47.5
7	286 28.8	46.6
8	301 29.0	45.6
9	316 29.3	·· 44.6
10	331 29.5	43.6
11	346 29.7	42.7
12	1 29.9	+ 1 41.7
13	16 30.1	40.7
14	31 30.4	39.8
15	46 30.6	·· 38.8
16	61 30.8	37.8
17	76 31.0	36.9
18	91 31.3	+ 1 35.9
19	106 31.5	34.9
20	121 31.7	34.0
21	136 31.9	·· 33.0
22	151 32.1	32.0
23	166 32.4	31.0
0	181 32.6	+ 1 30.1
1	196 32.8	29.1
2	211 33.0	28.1
3	226 33.3	·· 27.2
4	241 33.5	26.2
5	256 33.7	25.2
6	271 33.9	+ 1 24.3
7	286 34.1	23.3
8	301 34.4	22.3
9	316 34.6	·· 21.3
10	331 34.8	20.4
11	346 35.0	19.4
12	1 35.3	+ 1 18.4
13	16 35.5	17.5
14	31 35.7	16.5
15	46 35.9	·· 15.5
16	61 36.1	14.5
17	76 36.4	13.6
18	91 36.6	+ 1 12.6
19	106 36.8	11.6
20	121 37.0	10.7
21	136 37.3	·· 09.7
22	151 37.5	08.7
23	166 37.7	07.8
0	181 37.9	+ 1 06.8
1	196 38.1	05.8
2	211 38.4	04.8
3	226 38.6	·· 03.9
4	241 38.8	02.9
5	256 39.0	01.9
6	271 39.2	+ 1 01.0
7	286 39.5	1 00.0
8	301 39.7	0 59.0
9	316 39.9	·· 58.0
10	331 40.1	57.1
11	346 40.4	56.1
12	1 40.6	+ 0 55.1
13	16 40.8	54.1
14	31 41.0	53.2
15	46 41.2	·· 52.2
16	61 41.5	51.2
17	76 41.7	50.3
18	91 41.9	+ 0 49.3
19	106 42.1	48.3
20	121 42.3	47.3
21	136 42.6	·· 46.4
22	151 42.8	45.4
23	166 43.0	44.4
24	181 43.2	+ 0 43.5
code	—	− 9

STARS No.	SHA	Dec.	Transit Mer. Gr.
	° ′	° ′	h m
1	358 31.3	+28 49.6	0 14
2	358 20.7	+58 53.1	0 14
3	349 42.0	−18 14.9	0 49
4	339 20.0	+59 59.2	1 30
5	336 00.4	−57 28.6	1 43
6	332 21.7	+89 02.2	1 58
7	328 53.0	+23 14.3	2 12
8	315 53.1	−40 29.4	3 04
9	309 46.7	+49 41.5	3 28
10	291 42.6	+16 25.0	4 40
11	281 56.6	− 8 15.0	5 19
12	281 43.1	+45 57.1	5 20
13	279 21.8	+ 6 18.7	5 29
14	279 11.3	+28 34.2	5 30
15	276 33.5	− 1 13.6	5 41
16	271 51.6	+ 7 24.2	5 59
17	264 16.9	−52 39.6	6 29
18	259 14.7	−16 38.5	6 50
19	255 49.1	−28 53.9	7 03
20	245 48.4	+ 5 21.2	7 43
21	244 24.6	+28 08.8	7 49
22	234 37.6	−59 20.8	8 28
23	223 27.1	−43 13.9	9 12
24	221 50.8	−69 30.8	9 19
25	218 42.0	− 8 26.7	9 31
26	208 33.1	+12 12.4	10 12
27	194 48.8	+62 00.7	11 07
28	183 21.2	+14 50.6	11 52
29	174 02.4	−62 50.0	12 29
30	172 53.6	−56 50.6	12 34
31	168 47.5	−59 25.6	12 50
32	167 01.6	+56 13.4	12 57
33	159 30.5	+55 10.7	13 27
34	159 20.5	−10 54.6	13 28
35	153 35.6	+49 33.3	13 51
36	149 02.8	−36 08.1	14 09
37	146 38.3	+19 26.1	14 19
38	140 56.0	−60 38.6	14 42
39	137 18.1	+74 21.3	14 56
40	126 50.4	+26 52.7	15 38
41	120 38.0	−22 29.3	16 03
42	113 23.4	−26 19.8	16 31
43	109 07.2	−68 56.9	16 48
44	103 05.9	−15 40.1	17 12
45	97 25.0	−37 04.5	17 35
46	96 49.6	+12 35.7	17 37
47	91 07.7	+51 29.8	18 00
48	84 45.3	−34 24.8	18 26
49	81 10.3	+38 44.4	18 40
50	76 55.7	−26 21.7	18 57
51	62 53.4	+ 8 44.4	19 53
52	54 31.8	−56 53.7	20 26
53	50 03.0	+45 06.6	20 44
54	34 32.5	+ 9 39.3	21 46
55	28 41.3	−47 11.8	22 09
56	16 14.7	−29 52.6	22 59
57	14 24.3	+14 56.9	23 06

Lat.	Sunrise	Twlt. begins	Moonrise 19	20	21	22
N °	h m	h m	h m	h m	h m	h m
70	5 29	0 44	□	□	□	□
68	5 31	1 41	15 58	□	□	□
66	5 33	2 12	16 53	□	□	□
64	5 35	2 35	17 26	16 57	□	□
62	5 36	2 52	17 50	17 44	17 33	□
60	5 38	3 06	18 10	18 14	18 26	18 57
58	5 39	3 18	18 26	18 38	18 58	19 36
56	5 40	3 28	18 40	18 56	19 22	20 03
54	5 41	3 36	18 52	19 12	19 42	20 24
52	5 41	3 44	19 02	19 26	19 58	20 42
50	5 42	3 50	19 12	19 38	20 12	20 57
45	5 44	4 02	19 32	20 03	20 41	21 28
40	5 45	4 13	19 48	20 23	21 04	21 51
35	5 46	4 20	20 02	20 39	21 22	22 11
30	5 47	4 26	20 14	20 54	21 38	22 28
20	5 48	4 35	20 35	21 19	22 06	22 56
10	5 49	4 39	20 53	21 40	22 29	23 21
0	5 50	4 42	21 11	22 00	22 51	23 43
10	5 51	4 42	21 28	22 20	23 14	24 06
20	5 52	4 40	21 46	22 42	23 37	24 30
30	5 53	4 34	22 08	23 07	24 05	0 05
35	5 53	4 31	22 20	23 22	24 21	0 21
40	5 54	4 25	22 35	23 40	24 41	0 41
45	5 54	4 18	22 53	24 01	0 01	1 04
50	5 55	4 08	23 14	24 28	0 28	1 34
52	5 55	4 03	23 25	24 41	0 41	1 49
54	5 55	3 58	23 36	24 56	0 56	2 06
56	5 56	3 51	23 50	25 13	1 13	2 27
58	5 56	3 44	24 06	0 06	1 35	2 54
60	5 56	3 35	24 25	0 25	2 02	3 31
S						

Lat.	Sunset	Twlt. ends	Moonset 19	20	21	22
N °	h m	h m	h m	h m	h m	h m
70	18 16	22 45	□	□	□	□
68	18 14	21 57	13 41	□	□	□
66	18 12	21 27	12 48	□	□	□
64	18 11	21 07	12 16	14 27	□	□
62	18 09	20 49	11 52	13 41	15 37	□
60	18 08	20 36	11 33	13 11	14 45	16 02
58	18 07	20 25	11 18	12 48	14 13	15 23
56	18 06	20 16	11 05	12 30	13 49	14 56
54	18 06	20 08	10 53	12 15	13 30	14 34
52	18 05	20 01	10 43	12 01	13 14	14 17
50	18 04	19 54	10 34	11 50	13 00	14 02
45	18 03	19 42	10 15	11 26	12 32	13 31
40	18 02	19 33	10 00	11 06	12 10	13 08
35	18 01	19 26	9 47	10 50	11 51	12 48
30	18 00	19 20	9 36	10 37	11 36	12 31
20	17 59	19 12	9 17	10 13	11 09	12 03
10	17 58	19 08	9 01	9 53	10 46	11 39
0	17 57	19 06	8 45	9 34	10 25	11 16
10	17 56	19 06	8 30	9 15	10 04	10 54
20	17 56	19 09	8 14	8 55	9 41	10 30
30	17 55	19 15	7 55	8 32	9 14	10 01
35	17 55	19 19	7 44	8 19	8 59	9 45
40	17 54	19 25	7 32	8 03	8 41	9 25
45	17 54	19 33	7 17	7 45	8 19	9 02
50	17 54	19 43	7 00	7 22	7 52	8 31
52	17 53	19 47	6 51	7 11	7 39	8 16
54	17 53	19 53	6 42	6 59	7 23	7 59
56	17 53	20 00	6 32	6 45	7 05	7 38
58	17 53	20 08	6 20	6 28	6 43	7 11
60	17 53	20 17	6 06	6 09	6 15	6 33
S						

GCT	Equation of Time (App.—Mean) 19	20	21
h	m s	m s	m s
0	+ 5 48.6	+ 6 09.9	+ 6 31.2
6	+ 5 53.9	+ 6 15.3	+ 6 36.5
12	+ 5 59.3	+ 6 20.6	+ 6 41.8
18	+ 6 04.6	+ 6 25.9	+ 6 47.1
24	+ 6 09.9	+ 6 31.2	+ 6 52.5

GCT of Transit Meridian of Greenwich

DAY	Moon	Venus	Mars	Jupiter	Saturn
	h m	h m	h m	h m	h m
19	2 34	10 18	9 43	0 55	12 29
20	3 22	10 14	9 41	0 50	12 25
21	4 12	10 09	9 40	0 46	12 22
22	5 04	10 05	9 38	0 41	12 18

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb	Venus	Mars
°	′	′	′
0			
	0.3	0.4	0.1
30			
	0.3	0.4	0.0
45			
	0.3	0.3	0.0
60			
	0.3	0.2	0.0
75			
	0.3	0.1	0.0
90			

Moon's Lower Limb *Add*

Alt.	19	20	21
°	′	′	′
0			
	14.0	13.3	12.6
4			
	14.0	13.3	12.6
8			
	14.0	13.3	12.7
12			
	14.1	13.3	12.7
16			
	14.1	13.3	12.7
20			
	14.1	13.4	12.8
24			
	14.1	13.4	12.9
28			
	14.2	13.5	12.9
32			
	14.2	13.6	13.0
36			
	14.3	13.6	13.1
40			
	14.3	13.7	13.2
44			
	14.4	13.8	13.3
48			
	14.5	13.9	13.4
52			
	14.5	14.0	13.6
56			
	14.6	14.1	13.7
60			
	14.7	14.2	13.8
64			
	14.7	14.3	14.0
68			
	14.8	14.4	14.1
72			
	14.9	14.6	14.3
76			
	15.0	14.7	14.4
80			
	15.1	14.8	14.6
84			
	15.1	14.9	14.8
88			
	15.2	15.0	14.9
90			

Add to table, back cover

Moon's Upper Limb *Subtract*

Alt.	19	20	21
°	′	′	′
0			
	16.4	16.9	17.2
4			
	16.4	16.8	17.2
8			
	16.4	16.8	17.2
12			
	16.4	16.8	17.2
16			
	16.4	16.8	17.1
20			
	16.3	16.7	17.1
24			
	16.3	16.7	17.0
28			
	16.3	16.6	16.9
32			
	16.2	16.6	16.8
36			
	16.2	16.5	16.7
40			
	16.1	16.4	16.6
44			
	16.1	16.3	16.5
48			
	16.0	16.2	16.4
52			
	15.9	16.1	16.3
56			
	15.9	16.0	16.1
60			
	15.8	15.9	16.0
64			
	15.7	15.8	15.9
68			
	15.6	15.7	15.7
72			
	15.6	15.6	15.6
76			
	15.5	15.4	15.4
80			
	15.4	15.3	15.2
84			
	15.3	15.2	15.1
88			
	15.2	15.1	15.0
90			

Subtract from table, back cover

GCT	♈ GHA	VENUS −4.0 GHA	VENUS Dec.	MARS 1.9 GHA	MARS Dec.	JUPITER −2.5 GHA	JUPITER Dec.	SATURN 1.1 GHA	SATURN Dec.	MOON GHA	code	MOON Dec.	code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
0	0 03.0	208 15.4	+ 4 12.2	215 20.5	+15 22.1	349 38.6	+ 2 42.5	175 01.0	+ 0 09.4	286 40.1	98	+27 50.0	+ 31
1	15 05.4	223 17.9	12.7	230 21.4	21.6	4 41.4	42.3	190 03.2	09.2	301 08.9	98	27 53.1	+ 29
2	30 07.9	238 20.5	13.3	245 22.3	21.1	19 44.1	42.2	205 05.4	09.1	315 37.7	98	27 56.0	+ 28
3	45 10.3	253 23.1	·· 13.8	260 23.2	·· 20.6	34 46.9	·· 42.1	220 07.6	·· 09.0	330 06.5	97	·27 58.8	+ 27
4	60 12.8	268 25.7	14.3	275 24.2	20.1	49 49.6	41.9	235 09.8	08.9	344 35.2	98	28 01.5	+ 25
5	75 15.3	283 28.3	14.8	290 25.1	19.6	64 52.4	41.8	250 12.0	08.8	359 04.0	97	28 04.0	+ 24
6	90 17.7	298 30.8	+ 4 15.3	305 26.0	+15 19.1	79 55.2	+ 2 41.7	265 14.1	+ 0 08.6	13 32.7	98	+28 06.4	+ 23
7	105 20.2	313 33.4	15.9	320 27.0	18.6	94 57.9	41.5	280 16.3	08.5	28 01.5	97	28 08.7	+ 21
8	120 22.7	328 36.0	16.4	335 27.9	18.1	110 00.7	41.4	295 18.5	08.4	42 30.2	97	28 10.8	+ 20
9	135 25.1	343 38.5	·· 16.9	350 28.8	·· 17.7	125 03.4	·· 41.3	310 20.7	·· 08.3	56 58.9	97	·28 12.8	+ 18
10	150 27.6	358 41.1	17.4	5 29.7	17.2	140 06.2	41.2	325 22.9	08.1	71 27.6	97	28 14.6	+ 17
11	165 30.1	13 43.6	17.9	20 30.7	16.7	155 09.0	41.0	340 25.0	08.0	85 56.3	98	28 16.3	+ 16
12	180 32.5	28 46.2	+ 4 18.4	35 31.6	+15 16.2	170 11.7	+ 2 40.9	355 27.2	+ 0 07.9	100 25.1	97	+28 17.9	+ 14
13	195 35.0	43 48.7	18.9	50 32.5	15.7	185 14.5	40.8	10 29.4	07.8	114 53.8	97	28 19.3	+ 13
14	210 37.5	58 51.3	19.4	65 33.5	15.2	200 17.2	40.6	25 31.6	07.7	129 22.5	97	28 20.6	+ 11
15	225 39.9	73 53.8	·· 19.9	80 34.4	·· 14.7	215 20.0	·· 40.5	40 33.8	·· 07.5	143 51.2	97	·28 21.7	+ 10
16	240 42.4	88 56.3	20.5	95 35.3	14.2	230 22.8	40.4	55 36.0	07.4	158 19.9	97	28 22.7	+ 9
17	255 44.8	103 58.8	21.0	110 36.3	13.7	245 25.5	40.3	70 38.1	07.3	172 48.6	97	28 23.6	+ 7
18	270 47.3	119 01.4	+ 4 21.5	125 37.2	+15 13.2	260 28.3	+ 2 40.1	85 40.3	+ 0 07.2	187 17.3	97	+28 24.3	+ 6
19	285 49.8	134 03.9	22.0	140 38.1	12.7	275 31.0	40.0	100 42.5	07.1	201 46.0	97	28 24.9	+ 5
20	300 52.2	149 06.4	22.5	155 39.1	12.2	290 33.8	39.9	115 44.7	06.9	216 14.7	97	28 25.4	+ 3
21	315 54.7	164 08.9	·· 23.0	170 40.0	·· 11.7	305 36.6	·· 39.7	130 46.9	·· 06.8	230 43.4	98	·28 25.7	+ 1
22	330 57.2	179 11.4	23.5	185 40.9	11.2	320 39.3	39.6	145 49.0	06.7	245 12.2	97	28 25.8	+ 1
23	345 59.6	194 13.9	24.0	200 41.9	10.7	335 42.1	39.5	160 51.2	06.6	259 40.9	97	28 25.9	− 1
0	1 02.1	209 16.4	+ 4 24.5	215 42.8	+15 10.2	350 44.8	+ 2 39.4	175 53.4	+ 0 06.4	274 09.6	98	+28 25.8	− 3
1	16 04.6	224 18.9	25.0	230 43.7	09.7	5 47.6	39.2	190 55.6	06.3	288 38.4	98	28 25.5	− 4
2	31 07.0	239 21.4	25.5	245 44.7	09.3	20 50.4	39.1	205 57.8	06.2	303 07.2	97	28 25.1	− 5
3	46 09.5	254 23.9	·· 26.0	260 45.6	·· 08.8	35 53.1	·· 39.0	220 59.9	·· 06.1	317 35.9	98	·28 24.6	− 6
4	61 12.0	269 26.3	26.4	275 46.5	08.3	50 55.9	38.8	236 02.1	06.0	332 04.7	98	28 24.0	− 8
5	76 14.4	284 28.8	26.9	290 47.4	07.8	65 58.6	38.7	251 04.3	05.8	346 33.5	99	28 23.2	− 10
6	91 16.9	299 31.3	+ 4 27.4	305 48.4	+15 07.3	81 01.4	+ 2 38.6	266 06.5	+ 0 05.7	1 02.4	98	+28 22.2	− 10
7	106 19.3	314 33.8	27.9	320 49.3	06.8	96 04.2	38.4	281 08.7	05.6	15 31.2	98	28 21.2	− 12
8	121 21.8	329 36.2	28.4	335 50.2	06.3	111 06.9	38.3	296 10.9	05.5	30 00.0	99	28 20.0	− 14
9	136 24.3	344 38.7	·· 28.9	350 51.2	·· 05.8	126 09.7	·· 38.2	311 13.0	·· 05.3	44 28.9	99	·28 18.6	− 15
10	151 26.7	359 41.1	29.4	5 52.1	05.3	141 12.4	38.1	326 15.2	05.2	58 57.8	99	28 17.1	− 16
11	166 29.2	14 43.6	29.9	20 53.1	04.8	156 15.2	37.9	341 17.4	05.1	73 26.7	100	28 15.5	− 17
12	181 31.7	29 46.0	+ 4 30.3	35 54.0	+15 04.3	171 18.0	+ 2 37.8	356 19.6	+ 0 05.0	87 55.7	99	+28 13.8	− 19
13	196 34.1	44 48.5	30.8	50 54.9	03.8	186 20.7	37.7	11 21.8	04.9	102 24.6	100	28 11.9	− 21
14	211 36.6	59 50.9	31.3	65 55.9	03.3	201 23.5	37.5	26 23.9	04.7	116 53.6	100	28 09.8	− 21
15	226 39.1	74 53.4	·· 31.8	80 56.8	·· 02.8	216 26.3	·· 37.4	41 26.1	·· 04.6	131 22.6	100	·28 07.7	− 23
16	241 41.5	89 55.8	32.3	95 57.7	02.3	231 29.0	37.3	56 28.3	04.5	145 51.6	101	28 05.4	− 24
17	256 44.0	104 58.2	32.8	110 58.7	01.8	246 31.8	37.2	71 30.5	04.4	160 20.7	100	28 03.0	− 26
18	271 46.5	120 00.6	+ 4 33.2	125 59.6	+15 01.3	261 34.5	+ 2 37.0	86 32.7	+ 0 04.3	174 49.7	102	+28 00.4	− 27
19	286 48.9	135 03.1	33.7	141 00.5	00.8	276 37.3	36.9	101 34.9	04.1	189 18.9	101	27 57.7	− 28
20	301 51.4	150 05.5	34.2	156 01.5	15 00.3	291 40.1	36.8	116 37.0	04.0	203 48.0	102	27 54.9	− 30
21	316 53.8	165 07.9	·· 34.7	171 02.4	·14 59.8	306 42.8	·· 36.6	131 39.2	·· 03.9	218 17.2	102	·27 51.9	− 31
22	331 56.3	180 10.3	35.1	186 03.3	59.3	321 45.6	36.5	146 41.4	03.8	232 46.4	102	27 48.8	− 32
23	346 58.8	195 12.7	35.6	201 04.3	58.8	336 48.4	36.4	161 43.6	03.6	247 15.6	102	27 45.6	− 34
0	2 01.2	210 15.1	+ 4 36.1	216 05.2	+14 58.3	351 51.1	+ 2 36.2	176 45.8	+ 0 03.5	261 44.8	103	+27 42.2	− 35
1	17 03.7	225 17.5	36.5	231 06.1	57.8	6 53.9	36.1	191 47.9	03.4	276 14.1	104	27 38.7	− 36
2	32 06.2	240 19.9	37.0	246 07.1	57.3	21 56.6	36.0	206 50.1	03.3	290 43.5	103	27 35.1	− 38
3	47 08.6	255 22.3	·· 37.5	261 08.0	·· 56.8	36 59.4	·· 35.8	221 52.3	·· 03.2	305 12.8	104	·27 31.3	− 39
4	62 11.1	270 24.6	37.9	276 09.0	56.3	52 02.2	35.7	236 54.5	03.0	319 42.2	104	27 27.4	− 40
5	77 13.6	285 27.0	38.4	291 09.9	55.8	67 04.9	35.6	251 56.7	02.9	334 11.6	105	27 23.4	− 42
6	92 16.0	300 29.4	+ 4 38.9	306 10.8	+14 55.3	82 07.7	+ 2 35.5	266 58.8	+ 0 02.8	348 41.1	105	+27 19.2	− 42
7	107 18.5	315 31.8	39.3	321 11.8	54.8	97 10.5	35.3	282 01.0	02.7	3 10.6	106	27 15.0	− 45
8	122 20.9	330 34.1	39.8	336 12.7	54.3	112 13.2	35.2	297 03.2	02.5	17 40.2	105	27 10.5	− 45
9	137 23.4	345 36.5	·· 40.2	351 13.6	·· 53.8	127 16.0	·· 35.1	312 05.4	·· 02.4	32 09.7	107	·27 06.0	− 47
10	152 25.9	0 38.9	40.7	6 14.6	53.3	142 18.7	34.9	327 07.6	02.3	46 39.4	106	27 01.3	− 48
11	167 28.3	15 41.2	41.2	21 15.5	52.8	157 21.5	34.8	342 09.7	02.2	61 09.0	107	26 56.5	− 49
12	182 30.8	30 43.6	+ 4 41.6	36 16.5	+14 52.3	172 24.3	+ 2 34.7	357 11.9	+ 0 02.1	75 38.7	108	+26 51.6	− 50
13	197 33.3	45 45.9	42.1	51 17.4	51.8	187 27.0	34.5	12 14.1	01.9	90 08.5	108	26 46.6	− 52
14	212 35.7	60 48.3	42.5	66 18.3	51.3	202 29.8	34.4	27 16.3	01.8	104 38.3	108	26 41.4	− 53
15	227 38.2	75 50.6	·· 43.0	81 19.3	·· 50.8	217 32.6	·· 34.3	42 18.5	·· 01.7	119 08.1	109	·26 36.1	− 54
16	242 40.7	90 52.9	43.4	96 20.2	50.3	232 35.3	34.2	57 20.7	01.6	133 38.0	109	26 30.7	− 56
17	257 43.1	105 55.3	43.9	111 21.2	49.8	247 38.1	34.0	72 22.8	01.5	148 07.9	109	26 25.1	− 57
18	272 45.6	120 57.6	+ 4 44.3	126 22.1	+14 49.3	262 40.9	+ 2 33.9	87 25.0	+ 0 01.3	162 37.8	110	+26 19.4	− 57
19	287 48.1	135 59.9	44.8	141 23.0	48.8	277 43.6	33.8	102 27.2	01.2	177 07.8	111	26 13.7	− 60
20	302 50.5	151 02.2	45.2	156 24.0	48.3	292 46.4	33.6	117 29.4	01.1	191 37.9	111	26 07.7	− 60
21	317 53.0	166 04.6	·· 45.7	171 24.9	·· 47.8	307 49.2	·· 33.5	132 31.6	·· 01.0	206 08.0	111	·26 01.7	− 62
22	332 55.4	181 06.9	46.1	186 25.9	47.3	322 51.9	33.4	147 33.7	00.8	220 38.1	112	25 55.5	− 63
23	347 57.9	196 09.2	46.5	201 26.8	46.8	337 54.7	33.2	162 35.9	00.7	235 08.3	113	25 49.2	− 64
24	3 00.4	211 11.5	+ 4 47.0	216 27.7	+14 46.3	352 57.5	+ 2 33.1	177 38.1	+ 0 00.6	249 38.6	112	+25 42.8	− 65
code	—	+ 25	+ 5	+ 9	− 5	+ 27	− 1	+ 22	− 1				

GCT h	SUN GHA ° ′	Dec. ° ′
0	181 43.2	+ 0 43.5
1	196 43.4	42.5
2	211 43.7	41.5
3	226 43.9 ··	40.5
4	241 44.1	39.6
5	256 44.3	38.6
6	271 44.5	+ 0 37.6
7	286 44.8	36.6
8	301 45.0	35.7
9	316 45.2 ··	34.7
10	331 45.4	33.7
11	346 45.6	32.8
12	1 45.9	+ 0 31.8
13	16 46.1	30.8
14	31 46.3	29.8
15	46 46.5 ··	28.9
16	61 46.7	27.9
17	76 47.0	26.9
18	91 47.2	+ 0 25.9
19	106 47.4	25.0
20	121 47.6	24.0
21	136 47.8 ··	23.0
22	151 48.1	22.0
23	166 48.3	21.1
0	181 48.5	+ 0 20.1
1	196 48.7	19.1
2	211 48.9	18.2
3	226 49.2 ··	17.2
4	241 49.4	16.2
5	256 49.6	15.2
6	271 49.8	+ 0 14.3
7	286 50.0	13.3
8	301 50.3	12.3
9	316 50.5 ··	11.3
10	331 50.7	10.4
11	346 50.9	09.4
12	1 51.1	+ 0 08.4
13	16 51.4	07.4
14	31 51.6	06.5
15	46 51.8 ··	05.5
16	61 52.0	04.5
17	76 52.2	03.5
18	91 52.4	+ 0 02.6
19	106 52.7	01.6
20	121 52.9	+ 0 00.6
21	136 53.1	− 0 00.3
22	151 53.3	01.3
23	166 53.5	02.3
0	181 53.8	− 0 03.3
1	196 54.0	04.2
2	211 54.2	05.2
3	226 54.4 ··	06.2
4	241 54.6	07.2
5	256 54.8	08.1
6	271 55.1	− 0 09.1
7	286 55.3	10.1
8	301 55.5	11.1
9	316 55.7 ··	12.0
10	331 55.9	13.0
11	346 56.2	14.0
12	1 56.4	− 0 15.0
13	16 56.6	15.9
14	31 56.8	16.9
15	46 57.0 ··	17.9
16	61 57.2	18.9
17	76 57.5	19.8
18	91 57.7	− 0 20.8
19	106 57.9	21.8
20	121 58.1	22.8
21	136 58.3 ··	23.7
22	151 58.5	24.7
23	166 58.8	25.7
24	181 59.0	− 0 26.7
code	—	− 10

STARS No.	SHA ° ′	Dec. ° ′	Transit Mer. Gr. h m
1	358 31.3	+28 49.6	0 02
2	358 20.7	+58 53.1	0 02
3	349 42.0	−18 14.9	0 37
4	339 20.0	+59 59.2	1 18
5	336 00.4	−57 28.6	1 32
6	332 21.1	+89 02.2	1 46
7	328 53.0	+23 14.3	2 00
8	315 53.1	−40 29.5	2 52
9	309 46.7	+49 41.5	3 16
10	291 42.6	+16 25.0	4 28
11	281 56.6	− 8 15.0	5 07
12	281 43.0	+45 57.1	5 08
13	279 21.8	+ 6 18.7	5 18
14	279 11.3	+28 34.2	5 18
15	276 33.4	− 1 13.6	5 29
16	271 51.5	+ 7 24.2	5 47
17	264 16.8	−52 39.6	6 18
18	259 14.7	−16 38.5	6 38
19	255 49.1	−28 53.9	6 51
20	245 48.4	+ 5 21.2	7 31
21	244 24.5	+28 08.8	7 37
22	234 37.6	−59 20.8	8 16
23	223 27.1	−43 13.9	9 01
24	221 50.8	−69 30.8	9 07
25	218 42.0	− 8 26.7	9 20
26	208 33.1	+12 12.4	10 00
27	194 48.8	+62 00.7	10 55
28	183 21.2	+14 50.6	11 41
29	174 02.4	−62 49.9	12 18
30	172 53.6	−56 50.6	12 22
31	168 47.5	−59 25.6	12 39
32	167 01.6	+56 13.4	12 46
33	159 30.5	+55 10.7	13 16
34	159 20.5	−10 54.6	13 16
35	153 35.6	+49 33.3	13 39
36	149 02.8	−36 08.1	13 57
37	146 38.3	+19 26.0	14 07
38	140 56.1	−60 38.5	14 30
39	137 18.1	+74 21.3	14 44
40	126 50.5	+26 52.7	15 26
41	120 38.0	−22 29.3	15 51
42	113 23.4	−26 19.8	16 20
43	109 07.2	−68 56.9	16 37
44	103 05.9	−15 40.1	17 01
45	97 25.0	−37 04.5	17 23
46	96 49.6	+12 35.7	17 26
47	91 07.7	+51 29.8	17 48
48	84 45.3	−34 24.8	18 14
49	81 10.4	+38 44.4	18 28
50	76 55.7	−26 21.7	18 45
51	62 53.4	+ 8 44.4	19 41
52	54 31.8	−56 53.7	20 14
53	50 03.0	+45 06.6	20 32
54	34 32.5	+ 9 39.3	21 34
55	28 41.3	−47 11.8	21 57
56	16 14.7	−29 52.6	22 47
57	14 24.3	+14 56.9	22 54

Lat.	Sunrise	Twlt. begins	Moonrise 22	23	24	25
N °	h m	h m	h m	h m	h m	h m
70	5 41	1 24	□	□	□	□
68	5 42	2 02	□	□	□	□
66	5 43	2 29	□	□	□	21 17
64	5 43	2 49	□	□	□	22 07
62	5 44	3 03	□	18 45	20 50	22 38
60	5 45	3 16	18 57	20 01	21 28	23 01
58	5 45	3 26	19 36	20 36	21 54	23 20
56	5 46	3 36	20 03	21 02	22 15	23 36
54	5 46	3 43	20 24	21 22	22 32	23 49
52	5 46	3 50	20 42	21 39	22 47	24 00
50	5 47	3 55	20 57	21 54	22 59	24 11
45	5 47	4 07	21 28	22 23	23 25	24 32
40	5 48	4 16	21 51	22 46	23 46	24 49
35	5 48	4 22	22 11	23 05	24 03	0 03
30	5 48	4 28	22 28	23 22	24 18	0 18
20	5 49	4 36	22 56	23 49	24 43	0 43
10	5 49	4 39	23 21	24 13	0 13	1 05
0	5 49	4 41	23 43	24 35	0 35	1 25
10	5 49	4 40	24 06	0 06	0 57	1 45
20	5 49	4 37	24 30	0 30	1 20	2 06
30	5 49	4 31	0 05	0 59	1 48	2 31
35	5 49	4 26	0 21	1 16	2 04	2 45
40	5 49	4 20	0 41	1 35	2 22	3 02
45	5 49	4 12	1 04	1 59	2 45	3 22
50	5 49	4 01	1 34	2 30	3 14	3 47
52	5 48	3 56	1 49	2 45	3 28	3 59
54	5 48	3 50	2 06	3 03	3 45	4 13
56	5 48	3 43	2 27	3 25	4 04	4 29
58	5 48	3 35	2 54	3 53	4 28	4 47
60	5 48	3 25	3 31	4 33	5 01	5 11
S						

Lat.	Sunset	Twlt. ends	Moonset 22	23	24	25
N °	h m	h m	h m	h m	h m	h m
70	18 02	22 09	□	□	□	□
68	18 01	21 34	□	□	□	□
66	18 01	21 10	□	□	□	18 57
64	18 00	20 51	□	□	□	18 06
62	18 00	20 37	□	18 01	17 41	17 34
60	17 59	20 25	16 02	16 45	17 04	17 10
58	17 59	20 15	15 23	16 10	16 37	16 51
56	17 58	20 06	14 56	15 44	16 15	16 35
54	17 58	19 59	14 34	15 24	15 58	16 21
52	17 58	19 53	14 17	15 06	15 43	16 09
50	17 58	19 48	14 02	14 52	15 30	15 59
45	17 57	19 36	13 31	14 22	15 03	15 36
40	17 57	19 28	13 08	13 59	14 42	15 18
35	17 57	19 22	12 48	13 39	14 24	15 03
30	17 56	19 16	12 31	13 23	14 09	14 49
20	17 56	19 09	12 03	12 55	13 43	14 27
10	17 56	19 06	11 39	12 31	13 20	14 07
0	17 56	19 05	11 16	12 08	12 59	13 48
10	17 56	19 06	10 54	11 46	12 38	13 29
20	17 56	19 09	10 30	11 21	12 15	13 09
30	17 56	19 16	10 01	10 53	11 48	12 46
35	17 57	19 22	9 45	10 36	11 33	12 32
40	17 57	19 28	9 25	10 17	11 14	12 16
45	17 57	19 36	9 02	9 53	10 52	11 57
50	17 58	19 48	8 31	9 22	10 24	11 33
52	17 58	19 53	8 16	9 07	10 10	11 21
54	17 58	19 59	7 59	8 49	9 54	11 08
56	17 58	20 06	7 38	8 28	9 34	10 52
58	17 59	20 16	7 11	8 00	9 10	10 34
60	17 59	20 25	6 33	7 20	8 38	10 11
S						

Equation of Time (App.—Mean)

GCT h	22 m s	23 m s	24 m s
0	+ 6 52.5	+ 7 13.6	+ 7 34.6
6	+ 6 57.7	+ 7 18.8	+ 7 39.8
12	+ 7 03.0	+ 7 24.1	+ 7 45.0
18	+ 7 08.3	+ 7 29.4	+ 7 50.3
24	+ 7 13.6	+ 7 34.6	+ 7 55.5

GCT of Transit Meridian of Greenwich

DAY	Moon h m	Venus h m	Mars h m	Jupiter h m	Saturn h m
22	5 04	10 05	9 38	0 41	12 18
23	5 56	10 01	9 37	0 37	12 15
24	6 47	9 57	9 35	0 33	12 11
25	7 36	9 54	9 34	0 28	12 08

ADDITIONAL ALTITUDE CORRECTIONS

Alt. °	Sun's Low'r Limb ′	Venus ′	Mars ′
0			
	0.3	0.4	0.1
30			
	0.3	0.3	0.1
45			
	0.3	0.3	0.0
60			
	0.3	0.2	0.0
75			
	0.3	0.1	0.0
90			

Moon's Lower Limb *Add*

Alt. °	22 ′	23 ′	24 ′
0			
	12.2	12.0	12.1
4			
	12.3	12.0	12.1
8			
	12.3	12.0	12.2
12			
	12.3	12.1	12.2
16			
	12.4	12.1	12.2
20			
	12.4	12.2	12.3
24			
	12.5	12.3	12.4
28			
	12.6	12.4	12.5
32			
	12.7	12.5	12.6
36			
	12.8	12.6	12.7
40			
	12.9	12.7	12.8
44			
	13.0	12.8	12.9
48			
	13.2	13.0	13.1
52			
	13.3	13.1	13.2
56			
	13.5	13.3	13.4
60			
	13.6	13.5	13.5
64			
	13.8	13.6	13.7
68			
	14.0	13.8	13.9
72			
	14.1	14.0	14.1
76			
	14.3	14.2	14.3
80			
	14.5	14.4	14.4
84			
	14.7	14.6	14.6
88			
	14.8	14.7	14.8
90			

Add to table, back cover

Moon's Upper Limb *Subtract*

Alt. °	22 ′	23 ′	24 ′
0			
	17.4	17.6	17.5
4			
	17.4	17.6	17.5
8			
	17.4	17.5	17.5
12			
	17.4	17.5	17.4
16			
	17.3	17.5	17.4
20			
	17.3	17.4	17.3
24			
	17.2	17.3	17.2
28			
	17.1	17.2	17.2
32			
	17.0	17.1	17.1
36			
	16.9	17.0	16.9
40			
	16.8	16.9	16.8
44			
	16.6	16.7	16.7
48			
	16.5	16.6	16.6
52			
	16.4	16.4	16.4
56			
	16.2	16.3	16.2
60			
	16.1	16.1	16.1
64			
	15.9	15.9	15.9
68			
	15.7	15.7	15.7
72			
	15.6	15.6	15.6
76			
	15.4	15.4	15.4
80			
	15.2	15.2	15.2
84			
	15.0	15.0	15.0
88			
	14.9	14.8	14.9
90			

Subtract from table, back cover

Last Quarter 23

GCT	♈ GHA	VENUS −4.1 GHA	VENUS Dec.	MARS 1.9 GHA	MARS Dec.	JUPITER −2.5 GHA	JUPITER Dec.	SATURN 1.1 GHA	SATURN Dec.	MOON GHA	code	MOON Dec.	code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
0	3 00.4	211 11.5	+4 47.0	216 27.7	+14 46.3	352 57.5	+2 33.1	177 38.1	+0 00.6	249 38.6	112	+25 42.8	−65
1	18 02.8	226 13.8	47.4	231 28.7	45.8	8 00.2	33.0	192 40.3	00.5	264 08.8	114	25 36.3	−66
2	33 05.3	241 16.1	47.9	246 29.6	45.3	23 03.0	32.8	207 42.5	00.4	278 39.2	113	25 29.7	−68
3	48 07.8	256 18.4	·· 48.3	261 30.6	·· 44.8	38 05.7	·· 32.7	222 44.6	·· 00.2	293 09.5	115	·25 22.9	−69
4	63 10.2	271 20.7	48.7	276 31.5	44.3	53 08.5	32.6	237 46.8	+0 00.1	307 40.0	114	25 16.0	−70
5	78 12.7	286 22.9	49.2	291 32.4	43.8	68 11.3	32.5	252 49.0	0 00.0	322 10.4	116	25 09.0	−71
6	93 15.2	301 25.2	+4 49.6	306 33.4	+14 43.3	83 14.0	+2 32.3	267 51.2	−0 00.1	336 41.0	115	+25 01.9	−73
7	108 17.6	316 27.5	50.0	321 34.3	42.8	98 16.8	32.2	282 53.4	00.3	351 11.5	116	24 54.6	−73
8	123 20.1	331 29.8	50.5	336 35.3	42.3	113 19.6	32.1	297 55.5	00.4	5 42.1	117	24 47.3	−75
9	138 22.5	346 32.0	·· 50.9	351 36.2	·· 41.8	128 22.3	·· 31.9	312 57.7	·· 00.5	20 12.8	117	·24 39.8	−76
10	153 25.0	1 34.3	51.3	6 37.2	41.3	143 25.1	31.8	327 59.9	00.6	34 43.5	118	24 32.2	−76
11	168 27.5	16 36.6	51.8	21 38.1	40.8	158 27.9	31.7	343 02.1	00.7	49 14.3	118	24 24.6	−79
12	183 29.9	31 38.8	+4 52.2	36 39.0	+14 40.3	173 30.6	+2 31.5	358 04.3	−0 00.9	63 45.1	119	+24 16.7	−79
13	198 32.4	46 41.1	52.6	51 40.0	39.8	188 33.4	31.4	13 06.5	01.0	78 16.0	119	24 08.8	−80
14	213 34.9	61 43.3	53.0	66 40.9	39.3	203 36.2	31.3	28 08.6	01.1	92 46.9	120	24 00.8	−82
15	228 37.3	76 45.6	·· 53.5	81 41.9	·· 38.8	218 38.9	·· 31.1	43 10.8	·· 01.2	107 17.9	120	·23 52.6	−82
16	243 39.8	91 47.8	53.9	96 42.8	38.3	233 41.7	31.0	58 13.0	01.3	121 48.9	121	23 44.4	−84
17	258 42.3	106 50.0	54.3	111 43.8	37.8	248 44.5	30.9	73 15.2	01.5	136 20.0	121	23 36.0	−85
18	273 44.7	121 52.3	+4 54.7	126 44.7	+14 37.3	263 47.2	+2 30.8	88 17.4	−0 01.6	150 51.1	122	+23 27.5	−85
19	288 47.2	136 54.5	55.1	141 45.6	36.8	278 50.0	30.6	103 19.5	01.7	165 22.3	122	23 19.0	−87
20	303 49.7	151 56.7	55.6	156 46.6	36.3	293 52.8	30.5	118 21.7	01.8	179 53.5	123	23 10.3	−88
21	318 52.1	166 58.9	·· 56.0	171 47.5	·· 35.8	308 55.5	·· 30.4	133 23.9	·· 02.0	194 24.8	123	·23 01.5	−89
22	333 54.6	182 01.2	56.4	186 48.5	35.2	323 58.3	30.2	148 26.1	02.1	208 56.1	124	22 52.6	−90
23	348 57.0	197 03.4	56.8	201 49.4	34.7	339 01.1	30.1	163 28.3	02.2	223 27.5	124	22 43.6	−92
0	3 59.5	212 05.6	+4 57.2	216 50.4	+14 34.2	354 03.8	+2 30.0	178 30.4	−0 02.3	237 58.9	125	+22 34.4	−92
1	19 02.0	227 07.8	57.6	231 51.3	33.7	9 06.6	29.8	193 32.6	02.4	252 30.4	125	22 25.2	−93
2	34 04.4	242 10.0	58.0	246 52.3	33.2	24 09.4	29.7	208 34.8	02.6	267 01.9	126	22 15.9	−94
3	49 06.9	257 12.2	·· 58.4	261 53.2	·· 32.7	39 12.1	·· 29.6	223 37.0	·· 02.7	281 33.5	126	·22 06.5	−96
4	64 09.4	272 14.4	58.8	276 54.1	32.2	54 14.9	29.4	238 39.2	02.8	296 05.1	127	21 56.9	−96
5	79 11.8	287 16.6	59.2	291 55.1	31.7	69 17.7	29.3	253 41.3	02.9	310 36.8	127	21 47.3	−97
6	94 14.3	302 18.8	+4 59.6	306 56.0	+14 31.2	84 20.4	+2 29.2	268 43.5	−0 03.1	325 08.5	128	+21 37.6	−99
7	109 16.8	317 20.9	5 00.1	321 57.0	30.7	99 23.2	29.0	283 45.7	03.2	339 40.3	128	21 27.7	−99
8	124 19.2	332 23.1	00.5	336 57.9	30.2	114 26.0	28.9	298 47.9	03.3	354 12.1	128	21 17.8	−100
9	139 21.7	347 25.3	·· 00.9	351 58.9	·· 29.7	129 28.7	·· 28.8	313 50.1	·· 03.4	8 43.9	130	·21 07.8	−102
10	154 24.2	2 27.5	01.3	6 59.8	29.2	144 31.5	28.6	328 52.2	03.5	23 15.9	129	20 57.6	−102
11	169 26.6	17 29.6	01.7	22 00.8	28.7	159 34.3	28.5	343 54.4	03.7	37 47.8	130	20 47.4	−103
12	184 29.1	32 31.8	+5 02.0	37 01.7	+14 28.2	174 37.0	+2 28.4	358 56.6	−0 03.8	52 19.8	131	+20 37.1	−104
13	199 31.5	47 34.0	02.4	52 02.7	27.7	189 39.8	28.3	13 58.8	03.9	66 51.9	131	20 26.7	−106
14	214 34.0	62 36.1	02.8	67 03.6	27.2	204 42.6	28.1	29 01.0	04.0	81 24.0	132	20 16.1	−106
15	229 36.5	77 38.3	·· 03.2	82 04.6	·· 26.6	219 45.4	·· 28.0	44 03.1	·· 04.1	95 56.2	132	·20 05.5	−107
16	244 38.9	92 40.4	03.6	97 05.5	26.1	234 48.1	27.9	59 05.3	04.3	110 28.4	132	19 54.8	−108
17	259 41.4	107 42.6	04.0	112 06.4	25.6	249 50.9	27.7	74 07.5	04.4	125 00.6	133	19 44.0	−109
18	274 43.9	122 44.7	+5 04.4	127 07.4	+14 25.1	264 53.7	+2 27.6	89 09.7	−0 04.5	139 32.9	134	+19 33.1	−109
19	289 46.3	137 46.8	04.8	142 08.3	24.6	279 56.4	27.5	104 11.9	04.6	154 05.3	133	19 22.2	−111
20	304 48.8	152 49.0	05.2	157 09.3	24.1	294 59.2	27.3	119 14.0	04.8	168 37.6	135	19 11.1	−112
21	319 51.3	167 51.1	·· 05.6	172 10.2	·· 23.6	310 02.0	·· 27.2	134 16.2	·· 04.9	183 10.1	134	·18 59.9	−112
22	334 53.7	182 53.2	05.9	187 11.2	23.1	325 04.7	27.1	149 18.4	05.0	197 42.5	136	18 48.7	−114
23	349 56.2	197 55.4	06.3	202 12.1	22.6	340 07.5	26.9	164 20.6	05.1	212 15.1	135	18 37.3	−114
0	4 58.7	212 57.5	+5 06.7	217 13.1	+14 22.1	355 10.3	+2 26.8	179 22.8	−0 05.2	226 47.6	136	+18 25.9	−115
1	20 01.1	227 59.6	07.1	232 14.0	21.6	10 13.0	26.7	194 24.9	05.4	241 20.2	137	18 14.4	−116
2	35 03.6	243 01.7	07.5	247 15.0	21.1	25 15.8	26.5	209 27.1	05.5	255 52.9	137	18 02.8	−117
3	50 06.0	258 03.8	·· 07.8	262 15.9	·· 20.6	40 18.6	·· 26.4	224 29.3	·· 05.6	270 25.6	137	·17 51.1	−118
4	65 08.5	273 05.9	08.2	277 16.9	20.0	55 21.3	26.3	239 31.5	05.7	284 58.3	138	17 39.3	−118
5	80 11.0	288 08.0	08.6	292 17.8	19.5	70 24.1	26.1	254 33.7	05.8	299 31.1	138	17 27.5	−120
6	95 13.4	303 10.1	+5 09.0	307 18.8	+14 19.0	85 26.9	+2 26.0	269 35.8	−0 06.0	314 03.9	138	+17 15.5	−120
7	110 15.9	318 12.2	09.3	322 19.7	18.5	100 29.6	25.9	284 38.0	06.1	328 36.7	139	17 03.5	−121
8	125 18.4	333 14.3	09.7	337 20.7	18.0	115 32.4	25.8	299 40.2	06.2	343 09.6	139	16 51.4	−122
9	140 20.8	348 16.4	·· 10.1	352 21.6	·· 17.5	130 35.2	·· 25.6	314 42.4	·· 06.3	357 42.5	140	·16 39.2	−122
10	155 23.3	3 18.4	10.4	7 22.6	17.0	145 38.0	25.5	329 44.6	06.5	12 15.5	140	16 27.0	−124
11	170 25.8	18 20.5	10.8	22 23.5	16.5	160 40.7	25.4	344 46.7	06.6	26 48.5	140	16 14.6	−124
12	185 28.2	33 22.6	+5 11.2	37 24.5	+14 16.0	175 43.5	+2 25.2	359 48.9	−0 06.7	41 21.5	141	+16 02.2	−125
13	200 30.7	48 24.7	11.5	52 25.4	15.5	190 46.3	25.1	14 51.1	06.8	55 54.6	141	15 49.7	−125
14	215 33.1	63 26.7	11.9	67 26.4	15.0	205 49.0	25.0	29 53.3	06.9	70 27.7	141	15 37.2	−127
15	230 35.6	78 28.8	·· 12.3	82 27.3	·· 14.4	220 51.8	·· 24.8	44 55.5	·· 07.1	85 00.8	142	·15 24.5	−127
16	245 38.1	93 30.8	12.6	97 28.3	13.9	235 54.6	24.7	59 57.6	07.2	99 34.0	142	15 11.8	−128
17	260 40.5	108 32.9	13.0	112 29.2	13.4	250 57.3	24.6	74 59.8	07.3	114 07.2	143	14 59.0	−129
18	275 43.0	123 34.9	+5 13.3	127 30.2	+14 12.9	266 00.1	+2 24.4	90 02.0	−0 07.4	128 40.5	142	+14 46.1	−129
19	290 45.5	138 37.0	13.7	142 31.1	12.4	281 02.9	24.3	105 04.2	07.5	143 13.7	143	14 33.2	−131
20	305 47.9	153 39.0	14.1	157 32.1	11.9	296 05.7	24.2	120 06.4	07.7	157 47.0	144	14 20.1	−130
21	320 50.4	168 41.1	·· 14.4	172 33.0	·· 11.4	311 08.4	·· 24.0	135 08.6	·· 07.8	172 20.4	143	·14 07.1	−132
22	335 52.9	183 43.1	14.8	187 34.0	10.9	326 11.2	23.9	150 10.7	07.9	186 53.7	144	13 53.9	−132
23	350 55.3	198 45.1	15.1	202 35.0	10.4	341 14.0	23.8	165 12.9	08.0	201 27.1	144	13 40.7	−133
24	5 57.8	213 47.2	+5 15.5	217 35.9	+14 09.9	356 16.7	+2 23.6	180 15.1	−0 08.2	216 00.5	145	+13 27.4	−134
code	—	+22	+4	+10	−5	+28	−1	+22	−1				

GCT	SUN GHA	SUN Dec.
h	° ′	° ′
0	181 59.0	− 0 26.7
1	196 59.2	27.6
2	211 59.4	28.6
3	226 59.6 ••	29.6
4	241 59.8	30.6
5	257 00.1	31.5
6	272 00.3	− 0 32.5
7	287 00.5	33.5
8	302 00.7	34.5
9	317 00.9 ••	35.4
10	332 01.1	36.4
11	347 01.3	37.4
12	2 01.6	− 0 38.4
13	17 01.8	39.3
14	32 02.0	40.3
15	47 02.2 ••	41.3
16	62 02.4	42.3
17	77 02.6	43.2
18	92 02.9	− 0 44.2
19	107 03.1	45.2
20	122 03.3	46.2
21	137 03.5 ••	47.1
22	152 03.7	48.1
23	167 03.9	49.1
0	182 04.1	− 0 50.1
1	197 04.4	51.0
2	212 04.6	52.0
3	227 04.8 ••	53.0
4	242 05.0	54.0
5	257 05.2	54.9
6	272 05.4	− 0 55.9
7	287 05.7	56.9
8	302 05.9	57.9
9	317 06.1 ••	58.8
10	332 06.3	0 59.8
11	347 06.5	1 00.8
12	2 06.7	− 1 01.8
13	17 06.9	02.7
14	32 07.2	03.7
15	47 07.4 ••	04.7
16	62 07.6	05.7
17	77 07.8	06.6
18	92 08.0	− 1 07.6
19	107 08.2	08.6
20	122 08.4	09.6
21	137 08.6 ••	10.5
22	152 08.9	11.5
23	167 09.1	12.5
0	182 09.3	− 1 13.5
1	197 09.5	14.4
2	212 09.7	15.4
3	227 09.9 ••	16.4
4	242 10.1	17.4
5	257 10.3	18.3
6	272 10.6	− 1 19.3
7	287 10.8	20.3
8	302 11.0	21.3
9	317 11.2 ••	22.2
10	332 11.4	23.2
11	347 11.6	24.2
12	2 11.8	− 1 25.1
13	17 12.0	26.1
14	32 12.3	27.1
15	47 12.5 ••	28.1
16	62 12.7	29.0
17	77 12.9	30.0
18	92 13.1	− 1 31.0
19	107 13.3	32.0
20	122 13.5	32.9
21	137 13.7 ••	33.9
22	152 13.9	34.9
23	167 14.2	35.9
24	182 14.4	− 1 36.8
code	—	− 9

STARS No.	SHA	Dec.	Transit Mer. Gr.
	° ′	° ′	h m
1	358 31.3	+28 49.6	23 46
2	358 20.7	+58 53.1	23 47
3	349 42.0	−18 14.9	0 25
4	339 20.0	+59 59.2	1 07
5	336 00.4	−57 28.6	1 20
6	332 20.5	+89 02.2	1 34
7	328 53.0	+23 14.3	1 48
8	315 53.1	−40 29.5	2 40
9	309 46.7	+49 41.5	3 04
10	291 42.6	+16 25.0	4 16
11	281 56.6	− 8 15.0	4 55
12	281 43.0	+45 57.1	4 56
13	279 21.7	+ 6 18.7	5 06
14	279 11.3	+28 34.2	5 06
15	276 33.4	− 1 13.6	5 17
16	271 51.5	+ 7 24.2	5 36
17	264 16.8	−52 39.6	6 06
18	259 14.7	−16 38.5	6 26
19	255 49.1	−28 53.9	6 40
20	245 48.4	+ 5 21.2	7 20
21	244 24.5	+28 08.8	7 25
22	234 37.6	−59 20.8	8 04
23	223 27.1	−43 13.9	8 49
24	221 50.7	−69 30.8	8 55
25	218 41.9	− 8 26.7	9 08
26	208 33.1	+12 12.4	9 48
27	194 48.8	+62 00.7	10 43
28	183 21.2	+14 50.6	11 29
29	174 02.4	−62 49.9	12 06
30	172 53.6	−56 50.6	12 10
31	168 47.5	−59 25.5	12 27
32	167 01.6	+56 13.3	12 34
33	159 30.5	+55 10.7	13 04
34	159 20.5	−10 54.6	13 05
35	153 35.6	+49 33.3	13 27
36	149 02.8	−36 08.1	13 46
37	146 38.3	+19 26.0	13 55
38	140 56.1	−60 38.5	14 18
39	137 18.2	+74 21.3	14 32
40	126 50.5	+26 52.7	15 14
41	120 38.0	−22 29.3	15 39
42	113 23.4	−26 19.8	16 08
43	109 07.3	−68 56.9	16 25
44	103 05.9	−15 40.1	16 49
45	97 25.0	−37 04.5	17 12
46	96 49.6	+12 35.7	17 14
47	91 07.7	+51 29.8	17 37
48	84 45.3	−34 24.8	18 02
49	81 10.4	+38 44.4	18 16
50	76 55.7	−26 21.7	18 33
51	62 53.4	+ 8 44.4	19 29
52	54 31.8	−56 53.7	20 03
53	50 03.0	+45 06.6	20 20
54	34 32.5	+ 9 39.3	21 22
55	28 41.3	−47 11.8	21 46
56	16 14.7	−29 52.6	22 35
57	14 24.3	+14 56.9	22 43

Lat.	Sunrise	Twlt. begins	Moonrise 25	26	27	28
N °	h m	h m	h m	h m	h m	h m
70	5 53	1 51	▭	22 17	24 58	0 58
68	5 52	2 22	▭	23 07	25 18	1 18
66	5 52	2 43	21 17	23 39	25 34	1 34
64	5 52	3 00	22 07	24 02	0 02	1 47
62	5 52	3 14	22 38	24 20	0 20	1 57
60	5 52	3 25	23 01	24 35	0 35	2 07
58	5 52	3 34	23 20	24 48	0 48	2 14
56	5 52	3 42	23 36	24 59	0 59	2 21
54	5 51	3 50	23 49	25 08	1 08	2 28
52	5 51	3 56	24 00	0 00	1 17	2 33
50	5 51	4 01	24 11	0 11	1 24	2 38
45	5 51	4 11	24 32	0 32	1 40	2 49
40	5 51	4 20	24 49	0 49	1 53	2 58
35	5 50	4 26	0 03	1 03	2 05	3 05
30	5 50	4 29	0 18	1 16	2 14	3 12
20	5 50	4 36	0 43	1 37	2 31	3 24
10	5 49	4 39	1 05	1 56	2 45	3 34
0	5 48	4 40	1 25	2 13	2 59	3 43
10	5 48	4 38	1 45	2 30	3 12	3 52
20	5 47	4 35	2 06	2 48	3 26	4 02
30	5 46	4 27	2 31	3 09	3 43	4 13
35	5 45	4 21	2 45	3 21	3 52	4 20
40	5 44	4 15	3 02	3 35	4 03	4 27
45	5 43	4 06	3 22	3 51	4 15	4 36
50	5 42	3 54	3 47	4 11	4 30	4 46
52	5 41	3 48	3 59	4 21	4 38	4 50
54	5 41	3 41	4 13	4 32	4 45	4 56
56	5 40	3 34	4 29	4 44	4 54	5 01
58	5 39	3 24	4 47	4 58	5 04	5 08
60	5 38	3 13	5 11	5 14	5 15	5 15
S						

Lat.	Sunset	Twlt. ends	Moonset 25	26	27	28
N °	h m	h m	h m	h m	h m	h m
70	17 48	21 42	▭	19 36	18 28	17 53
68	17 49	21 14	▭	18 44	18 07	17 42
66	17 49	20 53	18 57	18 12	17 49	17 33
64	17 49	20 37	18 06	17 48	17 35	17 25
62	17 50	20 25	17 34	17 29	17 23	17 18
60	17 50	20 14	17 10	17 13	17 13	17 13
58	17 50	20 04	16 51	16 59	17 04	17 07
56	17 51	19 58	16 35	16 48	16 56	17 03
54	17 51	19 51	16 21	16 37	16 49	16 58
52	17 51	19 45	16 09	16 28	16 43	16 55
50	17 51	19 40	15 59	16 20	16 37	16 51
45	17 52	19 30	15 36	16 03	16 24	16 44
40	17 52	19 22	15 18	15 48	16 14	16 37
35	17 52	19 16	15 03	15 36	16 05	16 32
30	17 53	19 13	14 49	15 25	15 57	16 27
20	17 53	19 06	14 27	15 07	15 43	16 18
10	17 54	19 04	14 07	14 50	15 32	16 11
0	17 55	19 04	13 48	14 35	15 20	16 04
10	17 56	19 06	13 29	14 20	15 09	15 57
20	17 57	19 10	13 09	14 03	14 56	15 49
30	17 58	19 18	12 46	13 44	14 42	15 40
35	17 59	19 24	12 32	13 33	14 34	15 35
40	18 00	19 31	12 16	13 20	14 24	15 29
45	18 01	19 41	11 57	13 05	14 13	15 22
50	18 02	19 53	11 33	12 46	14 00	15 14
52	18 03	19 59	11 21	12 37	13 53	15 10
54	18 04	20 07	11 08	12 27	13 46	15 06
56	18 04	20 14	10 52	12 15	13 38	15 01
58	18 05	20 24	10 34	12 02	13 29	14 56
60	18 06	20 35	10 11	11 46	13 19	14 50
S						

Equation of Time (App.—Mean)

GCT	25	26	27
h	m s	m s	m s
0	+ 7 55.5	+ 8 16.2	+ 8 36.7
6	+ 8 00.7	+ 8 21.3	+ 8 41.8
12	+ 8 05.8	+ 8 26.5	+ 8 46.9
18	+ 8 11.0	+ 8 31.6	+ 8 52.0
24	+ 8 16.2	+ 8 36.7	+ 8 57.0

GCT of Transit Meridian of Greenwich

DAY	Moon	Venus	Mars	Jupiter	Saturn
	h m	h m	h m	h m	h m
25	7 36	9 54	9 34	0 28	12 08
26	8 24	9 50	9 32	0 24	12 04
27	9 09	9 47	9 31	0 19	12 01
28	9 53	9 44	9 29	0 15	11 57

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb	Venus	Mars
°	′	′	′
0			
30	0.3	0.4	0.1
45	0.3	0.3	0.1
60	0.3	0.3	0.0
75	0.3	0.2	0.0
90	0.3	0.1	0.0

Moon's Lower Limb

Add

Alt.	25	26	27
°	′	′	′
0			
4	12.4	12.8	13.4
8	12.4	12.8	13.4
12	12.4	12.8	13.4
16	12.4	12.8	13.4
20	12.5	12.9	13.5
24	12.6	12.9	13.5
28	12.6	13.0	13.6
32	12.7	13.0	13.6
36	12.8	13.1	13.7
40	12.9	13.2	13.7
44	13.0	13.3	13.8
48	13.1	13.4	13.9
52	13.3	13.5	14.0
56	13.4	13.7	14.1
60	13.5	13.8	14.2
64	13.7	13.9	14.3
68	13.9	14.1	14.4
72	14.0	14.2	14.5
76	14.2	14.3	14.6
80	14.4	14.5	14.7
84	14.5	14.6	14.9
88	14.7	14.8	15.0
90	14.8	14.9	15.1

Add to table, back cover

Moon's Upper Limb

Subtract

Alt.	25	26	27
°	′	′	′
0			
4	17.4	17.2	16.8
8	17.4	17.1	16.8
12	17.3	17.1	16.8
16	17.3	17.1	16.7
20	17.2	17.0	16.7
24	17.2	17.0	16.7
28	17.1	16.9	16.6
32	17.0	16.9	16.6
36	16.9	16.8	16.5
40	16.8	16.7	16.4
44	16.7	16.6	16.4
48	16.6	16.5	16.3
52	16.5	16.4	16.2
56	16.3	16.2	16.1
60	16.2	16.1	16.0
64	16.0	16.0	15.9
68	15.9	15.8	15.8
72	15.7	15.7	15.7
76	15.6	15.6	15.6
80	15.4	15.4	15.4
84	15.2	15.3	15.3
88	15.0	15.1	15.2
90	14.9	15.0	15.1

Subtract from table, back cover

GCT	♈ GHA	VENUS −4.2 GHA	Dec.	MARS 1.9 GHA	Dec.	JUPITER −2.5 GHA	Dec.	SATURN 1.1 GHA	Dec.	MOON GHA	code	Dec.	code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
0	5 57.8	213 47.2	+ 5 15.5	217 35.9	+14 09.9	356 16.7	+ 2 23.6	180 15.1	− 0 08.2	216 00.5	145	+13 27.4	−134
1	21 00.3	228 49.2	15.8	232 36.9	09.3	11 19.5	23.5	195 17.3	08.3	230 34.0	144	13 14.0	−134
2	36 02.7	243 51.2	16.2	247 37.8	08.8	26 22.3	23.4	210 19.4	08.4	245 07.4	145	13 00.6	−135
3	51 05.2	258 53.2	·· 16.5	262 38.8	·· 08.3	41 25.0	·· 23.2	225 21.6	·· 08.5	259 40.9	145	· 12 47.1	−136
4	66 07.6	273 55.2	16.9	277 39.7	07.8	56 27.8	23.1	240 23.8	08.6	274 14.4	146	12 33.5	−136
5	81 10.1	288 57.3	17.2	292 40.7	07.3	71 30.6	23.0	255 26.0	08.8	288 48.0	145	12 19.9	−137
6	96 12.6	303 59.3	+ 5 17.5	307 41.6	+14 06.8	86 33.4	+ 2 22.8	270 28.2	− 0 08.9	303 21.5	146	+12 06.2	−137
7	111 15.0	319 01.3	17.9	322 42.6	06.3	101 36.1	22.7	285 30.3	09.0	317 55.1	146	11 52.5	−139
8	126 17.5	334 03.3	18.2	337 43.5	05.8	116 38.9	22.6	300 32.5	09.1	332 28.7	147	11 38.6	−138
9	141 20.0	349 05.3	·· 18.6	352 44.5	·· 05.2	131 41.7	·· 22.5	315 34.7	·· 09.2	347 02.4	146	· 11 24.8	−140
10	156 22.4	4 07.2	18.9	7 45.4	04.7	146 44.4	22.3	330 36.9	09.4	1 36.0	147	11 10.8	−140
11	171 24.9	19 09.2	19.2	22 46.4	04.2	161 47.2	22.2	345 39.1	09.5	16 09.7	147	10 56.8	−140
12	186 27.4	34 11.2	+ 5 19.6	37 47.4	+14 03.7	176 50.0	+ 2 22.1	0 41.2	− 0 09.6	30 43.4	147	+10 42.8	−141
13	201 29.8	49 13.2	19.9	52 48.3	03.2	191 52.7	21.9	15 43.4	09.7	45 17.1	147	10 28.7	−142
14	216 32.3	64 15.2	20.2	67 49.3	02.7	206 55.5	21.8	30 45.6	09.9	59 50.8	147	10 14.5	−142
15	231 34.7	79 17.1	·· 20.6	82 50.2	·· 02.2	221 58.3	·· 21.7	45 47.8	·· 10.0	74 24.5	148	· 10 00.3	−143
16	246 37.2	94 19.1	20.9	97 51.2	01.7	237 01.1	21.5	60 50.0	10.1	88 58.3	147	9 46.0	−143
17	261 39.7	109 21.1	21.2	112 52.1	01.1	252 03.8	21.4	75 52.1	10.2	103 32.0	148	9 31.7	−144
18	276 42.1	124 23.0	+ 5 21.5	127 53.1	+14 00.6	267 06.6	+ 2 21.3	90 54.3	− 0 10.3	118 05.8	148	+ 9 17.3	−144
19	291 44.6	139 25.0	21.9	142 54.0	14 00.1	282 09.4	21.1	105 56.5	10.5	132 39.6	148	9 02.9	−145
20	306 47.1	154 27.0	22.2	157 55.0	13 59.6	297 12.1	21.0	120 58.7	10.6	147 13.4	148	8 48.4	−145
21	321 49.5	169 28.9	·· 22.5	172 56.0	·· 59.1	312 14.9	·· 20.9	136 00.9	·· 10.7	161 47.2	148	· 8 33.9	−146
22	336 52.0	184 30.9	22.8	187 56.9	58.6	327 17.7	20.7	151 03.0	10.8	176 21.0	148	8 19.3	−147
23	351 54.5	199 32.8	23.2	202 57.9	58.1	342 20.5	20.6	166 05.2	10.9	190 54.8	148	8 04.6	−146
0	6 56.9	214 34.7	+ 5 23.5	217 58.8	+13 57.6	357 23.2	+ 2 20.5	181 07.4	− 0 11.1	205 28.6	149	+ 7 50.0	−148
1	21 59.4	229 36.7	23.8	232 59.8	57.0	12 26.0	20.3	196 09.6	11.2	220 02.5	148	7 35.2	−147
2	37 01.9	244 38.6	24.1	248 00.7	56.5	27 28.8	20.2	211 11.8	11.3	234 36.3	148	7 20.5	−149
3	52 04.3	259 40.5	·· 24.4	263 01.7	·· 56.0	42 31.5	·· 20.1	226 14.0	·· 11.4	249 10.1	149	· 7 05.6	−148
4	67 06.8	274 42.5	24.7	278 02.7	55.5	57 34.3	19.9	241 16.1	11.6	263 44.0	148	6 50.8	−149
5	82 09.2	289 44.4	25.0	293 03.6	55.0	72 37.1	19.8	256 18.3	11.7	278 17.8	149	6 35.9	−150
6	97 11.7	304 46.3	+ 5 25.4	308 04.6	+13 54.5	87 39.9	+ 2 19.7	271 20.5	− 0 11.8	292 51.7	148	+ 6 20.9	−150
7	112 14.2	319 48.2	25.7	323 05.5	54.0	102 42.6	19.5	286 22.7	11.9	307 25.5	149	6 05.9	−150
8	127 16.6	334 50.1	26.0	338 06.5	53.4	117 45.4	19.4	301 24.9	12.0	321 59.4	148	5 50.9	−151
9	142 19.1	349 52.0	·· 26.3	353 07.5	·· 52.9	132 48.2	·· 19.3	316 27.0	·· 12.2	336 33.2	148	· 5 35.8	−151
10	157 21.6	4 54.0	26.6	8 08.4	52.4	147 50.9	19.1	331 29.2	12.3	351 07.0	149	5 20.7	−151
11	172 24.0	19 55.9	26.9	23 09.4	51.9	162 53.7	19.0	346 31.4	12.4	5 40.9	148	5 05.6	−152
12	187 26.5	34 57.8	+ 5 27.2	38 10.3	+13 51.4	177 56.5	+ 2 18.9	1 33.6	− 0 12.5	20 14.7	148	+ 4 50.4	−152
13	202 29.0	49 59.6	27.5	53 11.3	50.9	192 59.3	18.7	16 35.8	12.6	34 48.5	148	4 35.2	−152
14	217 31.4	65 01.5	27.8	68 12.2	50.3	208 02.0	18.6	31 37.9	12.8	49 22.3	148	4 20.0	−153
15	232 33.9	80 03.4	·· 28.1	83 13.2	·· 49.8	223 04.8	·· 18.5	46 40.1	·· 12.9	63 56.1	148	· 4 04.7	−153
16	247 36.3	95 05.3	28.4	98 14.2	49.3	238 07.6	18.3	61 42.3	13.0	78 29.9	148	3 49.4	−153
17	262 38.8	110 07.2	28.7	113 15.1	48.8	253 10.3	18.2	76 44.5	13.1	93 03.7	148	3 34.1	−154
18	277 41.3	125 09.1	+ 5 29.0	128 16.1	+13 48.3	268 13.1	+ 2 18.1	91 46.7	− 0 13.3	107 37.5	147	+ 3 18.7	−154
19	292 43.7	140 10.9	29.3	143 17.0	47.8	283 15.9	18.0	106 48.8	13.4	122 11.2	148	3 03.3	−154
20	307 46.2	155 12.8	29.6	158 18.0	47.3	298 18.7	17.8	121 51.0	13.5	136 45.0	147	2 47.9	−155
21	322 48.7	170 14.7	·· 29.9	173 19.0	·· 46.7	313 21.4	·· 17.7	136 53.2	·· 13.6	151 18.7	147	· 2 32.4	−155
22	337 51.1	185 16.5	30.2	188 19.9	46.2	328 24.2	17.6	151 55.4	13.7	165 52.4	147	2 16.9	−155
23	352 53.6	200 18.4	30.4	203 20.9	45.7	343 27.0	17.4	166 57.6	13.9	180 26.1	147	2 01.4	−155
0	7 56.1	215 20.3	+ 5 30.7	218 21.9	+13 45.2	358 29.7	+ 2 17.3	181 59.7	− 0 14.0	194 59.8	146	+ 1 45.9	−155
1	22 58.5	230 22.1	31.0	233 22.8	44.7	13 32.5	17.2	197 01.9	14.1	209 33.4	147	1 30.4	−156
2	38 01.0	245 24.0	31.3	248 23.8	44.2	28 35.3	17.0	212 04.1	14.2	224 07.1	146	1 14.8	−156
3	53 03.5	260 25.8	·· 31.6	263 24.7	·· 43.6	43 38.1	·· 16.9	227 06.3	·· 14.3	238 40.7	146	· 0 59.2	−156
4	68 05.9	275 27.6	31.9	278 25.7	43.1	58 40.8	16.8	242 08.4	14.5	253 14.3	145	0 43.6	−156
5	83 08.4	290 29.5	32.1	293 26.7	42.6	73 43.6	16.6	257 10.6	14.6	267 47.8	146	0 28.0	−156
6	98 10.8	305 31.3	+ 5 32.4	308 27.6	+13 42.1	88 46.4	+ 2 16.5	272 12.8	− 0 14.7	282 21.4	145	+ 0 12.4	−157
7	113 13.3	320 33.1	32.7	323 28.6	41.6	103 49.2	16.4	287 15.0	14.8	296 54.9	145	− 0 03.3	−157
8	128 15.8	335 35.0	33.0	338 29.5	41.0	118 51.9	16.2	302 17.2	15.0	311 28.4	144	0 19.0	−156
9	143 18.2	350 36.8	·· 33.3	353 30.5	·· 40.5	133 54.7	·· 16.1	317 19.3	·· 15.1	326 01.8	145	· 0 34.6	−157
10	158 20.7	5 38.6	33.5	8 31.5	40.0	148 57.5	16.0	332 21.5	15.2	340 35.3	144	0 50.3	−157
11	173 23.2	20 40.4	33.8	23 32.4	39.5	164 00.2	15.8	347 23.7	15.3	355 08.7	143	1 06.0	−158
12	188 25.6	35 42.2	+ 5 34.1	38 33.4	+13 39.0	179 03.0	+ 2 15.7	2 25.9	− 0 15.4	9 42.0	144	− 1 21.8	−157
13	203 28.1	50 44.1	34.3	53 34.4	38.5	194 05.8	15.6	17 28.1	15.6	24 15.4	143	1 37.5	−157
14	218 30.6	65 45.9	34.6	68 35.3	37.9	209 08.6	15.4	32 30.2	15.7	38 48.7	142	1 53.2	−157
15	233 33.0	80 47.7	·· 34.9	83 36.3	·· 37.4	224 11.3	·· 15.3	47 32.4	·· 15.8	53 21.9	143	· 2 08.9	−158
16	248 35.5	95 49.5	35.1	98 37.3	36.9	239 14.1	15.2	62 34.6	15.9	67 55.2	141	2 24.7	−157
17	263 38.0	110 51.3	35.4	113 38.2	36.4	254 16.9	15.0	77 36.8	16.0	82 28.3	142	2 40.4	−158
18	278 40.4	125 53.1	+ 5 35.7	128 39.2	+13 35.9	269 19.7	+ 2 14.9	92 39.0	− 0 16.2	97 01.5	141	− 2 56.2	−157
19	293 42.9	140 54.8	35.9	143 40.1	35.3	284 22.4	14.8	107 41.1	16.3	111 34.6	141	3 11.9	−158
20	308 45.3	155 56.6	36.2	158 41.1	34.8	299 25.2	14.6	122 43.3	16.4	126 07.7	140	3 27.7	−157
21	323 47.8	170 58.4	·· 36.4	173 42.1	·· 34.3	314 28.0	·· 14.5	137 45.5	·· 16.5	140 40.7	140	· 3 43.4	−158
22	338 50.3	186 00.2	36.7	188 43.0	33.8	329 30.7	14.4	152 47.7	16.6	155 13.7	139	3 59.2	−157
23	353 52.7	201 02.0	37.0	203 44.0	33.3	344 33.5	14.2	167 49.9	16.8	169 46.6	139	4 14.9	−157
24	8 55.2	216 03.7	+ 5 37.2	218 45.0	+13 32.8	359 36.3	+ 2 14.1	182 52.0	− 0 16.9	184 19.5	139	− 4 30.6	−158
code	—	+ 18	+ 3	+ 10	− 5	+ 28	− 2	+ 22	− 1				

GCT	SUN GHA	SUN Dec.
h	° ′	° ′
0	182 14.4	− 1 36.8
1	197 14.6	37.8
2	212 14.8	38.8
3	227 15.0 ··	39.8
4	242 15.2	40.7
5	257 15.4	41.7
6	272 15.6	− 1 42.7
7	287 15.8	43.7
8	302 16.0	44.6
9	317 16.3 ··	45.6
10	332 16.5	46.6
11	347 16.7	47.6
12	2 16.9	− 1 48.5
13	17 17.1	49.5
14	32 17.3	50.5
15	47 17.5 ··	51.5
16	62 17.7	52.4
17	77 17.9	53.4
18	92 18.1	− 1 54.4
19	107 18.3	55.4
20	122 18.6	56.3
21	137 18.8 ··	57.3
22	152 19.0	58.3
23	167 19.2	1 59.3
0	182 19.4	− 2 00.2
1	197 19.6	01.2
2	212 19.8	02.2
3	227 20.0 ··	03.2
4	242 20.2	04.1
5	257 20.4	05.1
6	272 20.6	− 2 06.1
7	287 20.8	07.1
8	302 21.1	08.0
9	317 21.3 ··	09.0
10	332 21.5	10.0
11	347 21.7	10.9
12	2 21.9	− 2 11.9
13	17 22.1	12.9
14	32 22.3	13.9
15	47 22.5 ··	14.8
16	62 22.7	15.8
17	77 22.9	16.8
18	92 23.1	− 2 17.8
19	107 23.3	18.7
20	122 23.5	19.7
21	137 23.7 ··	20.7
22	152 23.9	21.7
23	167 24.2	22.6
0	182 24.4	− 2 23.6
1	197 24.6	24.6
2	212 24.8	25.5
3	227 25.0 ··	26.5
4	242 25.2	27.5
5	257 25.4	28.5
6	272 25.6	− 2 29.4
7	287 25.8	30.4
8	302 26.0	31.4
9	317 26.2 ··	32.4
10	332 26.4	33.3
11	347 26.6	34.3
12	2 26.8	− 2 35.3
13	17 27.0	36.3
14	32 27.2	37.2
15	47 27.4 ··	38.2
16	62 27.6	39.2
17	77 27.8	40.1
18	92 28.0	− 2 41.1
19	107 28.2	42.1
20	122 28.5	43.1
21	137 28.7 ··	44.0
22	152 28.9	45.0
23	167 29.1	46.0
24	182 29.3	− 2 46.9
code	—	− 10

No.	STARS SHA	Dec.	Transit Mer. Gr.
	° ′	° ′	h m
1	358 31.3	+28 49.6	23 34
2	358 20.7	+58 53.2	23 35
3	349 42.0	−18 14.9	0 13
4	339 19.9	+59 59.2	0 55
5	336 00.4	−57 28.6	1 08
6	332 20.0	+89 02.2	1 23
7	328 52.9	+23 14.3	1 36
8	315 53.1	−40 29.5	2 28
9	309 46.7	+49 41.5	2 53
10	291 42.5	+16 25.0	4 05
11	281 56.6	− 8 15.0	4 44
12	281 43.0	+45 57.1	4 45
13	279 21.7	+ 6 18.7	4 54
14	279 11.2	+28 34.2	4 55
15	276 33.4	− 1 13.6	5 05
16	271 51.5	+ 7 24.2	5 24
17	264 16.8	−52 39.6	5 54
18	259 14.6	−16 38.5	6 14
19	255 49.1	−28 53.9	6 28
20	245 48.4	+ 5 21.2	7 08
21	244 24.5	+28 08.8	7 13
22	234 37.5	−59 20.8	7 52
23	223 27.0	−43 13.9	8 37
24	221 50.7	−69 30.8	8 43
25	218 41.9	− 8 26.7	8 56
26	208 33.1	+12 12.4	9 36
27	194 48.8	+62 00.7	10 31
28	183 21.2	+14 50.6	11 17
29	174 02.3	−62 49.9	11 54
30	172 53.6	−56 50.6	11 59
31	168 47.5	−59 25.5	12 15
32	167 01.6	+56 13.3	12 22
33	159 30.5	+55 10.7	12 52
34	159 20.5	−10 54.6	12 53
35	153 35.6	+49 33.3	13 16
36	149 02.8	−36 08.1	13 34
37	146 38.3	+19 26.0	13 43
38	140 56.1	−60 38.5	14 06
39	137 18.2	+74 21.3	14 21
40	126 50.5	+26 52.6	15 02
41	120 38.0	−22 29.3	15 27
42	113 23.4	−26 19.8	15 56
43	109 07.3	−68 56.9	16 13
44	103 05.9	−15 40.1	16 37
45	97 25.1	−37 04.5	17 00
46	96 49.6	+12 35.7	17 02
47	91 07.8	+51 29.8	17 25
48	84 45.3	−34 24.8	17 50
49	81 10.4	+38 44.4	18 05
50	76 55.7	−26 21.7	18 21
51	62 53.4	+ 8 44.4	19 17
52	54 31.8	−56 53.8	19 51
53	50 03.0	+45 06.6	20 09
54	34 32.5	+ 9 39.3	21 11
55	28 41.4	−47 11.8	21 34
56	16 14.7	−29 52.7	22 24
57	14 24.3	+14 56.9	22 31

Lat.	Sunrise	Twlt. begins	Moonrise 28	29	30	1
N °	h m	h m	h m	h m	h m	h m
70	6 04	2 13	0 58	3 05	5 06	7 09
68	6 03	2 38	1 18	3 14	5 06	7 01
66	6 02	2 57	1 34	3 21	5 06	6 54
64	6 01	3 12	1 47	3 27	5 07	6 49
62	6 00	3 24	1 57	3 32	5 07	6 44
60	5 59	3 33	2 07	3 37	5 07	6 40
58	5 58	3 42	2 14	3 41	5 07	6 36
56	5 57	3 49	2 21	3 44	5 07	6 33
54	5 57	3 56	2 28	3 47	5 08	6 30
52	5 56	4 01	2 33	3 50	5 08	6 27
50	5 56	4 05	2 38	3 53	5 08	6 25
45	5 54	4 15	2 49	3 58	5 08	6 20
40	5 53	4 23	2 58	4 03	5 08	6 16
35	5 53	4 28	3 05	4 07	5 09	6 12
30	5 52	4 32	3 12	4 10	5 09	6 09
20	5 50	4 37	3 24	4 16	5 09	6 03
10	5 49	4 39	3 34	4 21	5 09	5 58
0	5 47	4 39	3 43	4 26	5 10	5 54
10	5 46	4 36	3 52	4 31	5 10	5 50
20	5 44	4 31	4 02	4 36	5 10	5 45
30	5 42	4 23	4 13	4 42	5 11	5 40
35	5 41	4 17	4 20	4 46	5 11	5 37
40	5 39	4 09	4 27	4 50	5 11	5 33
45	5 37	3 59	4 36	4 54	5 12	5 30
50	5 35	3 46	4 46	4 59	5 12	5 25
52	5 34	3 40	4 50	5 02	5 12	5 23
54	5 33	3 32	4 56	5 04	5 12	5 21
56	5 32	3 24	5 01	5 07	5 13	5 18
58	5 31	3 13	5 08	5 10	5 13	5 15
60	5 29	3 01	5 15	5 14	5 13	5 12
S						

Lat.	Sunset	Twlt. ends	Moonset 28	29	30	1
N °	h m	h m	h m	h m	h m	h m
70	17 35	21 20	17 53	17 25	16 59	16 31
68	17 36	20 55	17 42	17 22	17 02	16 41
66	17 38	20 38	17 33	17 19	17 05	16 50
64	17 39	20 24	17 25	17 16	17 07	16 57
62	17 40	20 12	17 18	17 14	17 09	17 04
60	17 41	20 03	17 13	17 12	17 10	17 10
58	17 42	19 55	17 07	17 10	17 12	17 15
56	17 43	19 49	17 03	17 08	17 13	17 19
54	17 43	19 42	16 58	17 07	17 15	17 23
52	17 44	19 37	16 55	17 05	17 16	17 27
50	17 45	19 33	16 51	17 04	17 17	17 30
45	17 46	19 24	16 44	17 01	17 19	17 38
40	17 47	19 17	16 37	16 59	17 21	17 44
35	17 48	19 12	16 32	16 57	17 22	17 49
30	17 49	19 08	16 27	16 55	17 24	17 54
20	17 51	19 04	16 18	16 52	17 26	18 02
10	17 52	19 02	16 11	16 50	17 28	18 09
0	17 54	19 03	16 04	16 47	17 31	18 16
10	17 56	19 06	15 57	16 44	17 33	18 23
20	17 58	19 12	15 49	16 41	17 35	18 30
30	18 00	19 20	15 40	16 38	17 37	18 38
35	18 01	19 26	15 35	16 36	17 39	18 43
40	18 03	19 35	15 29	16 34	17 40	18 49
45	18 05	19 45	15 22	16 32	17 42	18 55
50	18 07	19 59	15 14	16 28	17 44	19 03
52	18 08	20 06	15 10	16 27	17 45	19 06
54	18 09	20 13	15 06	16 25	17 46	19 10
56	18 10	20 22	15 01	16 24	17 48	19 15
58	18 12	20 33	14 56	16 22	17 49	19 20
60	18 14	20 46	14 50	16 20	17 51	19 25
S						

Equation of Time (App.—Mean)

GCT	28	29	30
h	m s	m s	m s
0	+ 8 57.0	+ 9 17.2	+ 9 37.0
6	+ 9 02.1	+ 9 22.1	+ 9 42.0
12	+ 9 07.1	+ 9 27.1	+ 9 46.9
18	+ 9 12.1	+ 9 32.1	+ 9 51.8
24	+ 9 17.2	+ 9 37.0	+ 9 56.7

GCT of Transit Meridian of Greenwich

DAY	Moon	Venus	Mars	Jupiter	Saturn
	h m	h m	h m	h m	h m
28	9 53	9 44	9 29	0 15	11 57
29	10 37	9 40	9 28	0 10	11 54
30	11 20	9 38	9 26	0 06	11 50
1	12 05	9 35	9 24	{0 02, 23 57}	11 47

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb	Venus	Mars
°	′	′	′
0			
	0.3	0.4	0.1
30			
	0.3	0.3	0.1
45			
	0.3	0.2	0.0
60			
	0.3	0.2	0.0
75			
	0.3	0.1	0.0
90			

Moon's Lower Limb

Add

Alt.	28	29	30
°	′	′	′
0			
	14.0	14.8	15.7
4			
	14.0	14.8	15.7
8			
	14.0	14.8	15.7
12			
	14.1	14.8	15.7
16			
	14.1	14.8	15.7
20			
	14.1	14.8	15.7
24			
	14.1	14.8	15.7
28			
	14.2	14.9	15.7
32			
	14.2	14.9	15.7
36			
	14.3	14.9	15.7
40			
	14.3	14.9	15.7
44			
	14.4	15.0	15.6
48			
	14.5	15.0	15.6
52			
	14.5	15.0	15.6
56			
	14.6	15.1	15.6
60			
	14.7	15.1	15.6
64			
	14.7	15.1	15.6
68			
	14.8	15.2	15.6
72			
	14.9	15.2	15.6
76			
	15.0	15.3	15.6
80			
	15.1	15.3	15.6
84			
	15.1	15.3	15.6
88			
	15.2	15.4	15.6
90			

Add to table, back cover

Moon's Upper Limb

Subtract

Alt.	28	29	30
°	′	′	′
0			
	16.4	16.0	15.5
4			
	16.4	16.0	15.5
8			
	16.4	16.0	15.5
12			
	16.4	16.0	15.5
16			
	16.4	16.0	15.5
20			
	16.3	15.9	15.5
24			
	16.3	15.9	15.5
28			
	16.3	15.9	15.5
32			
	16.2	15.9	15.5
36			
	16.2	15.9	15.5
40			
	16.1	15.8	15.5
44			
	16.1	15.8	15.5
48			
	16.0	15.8	15.5
52			
	15.9	15.7	15.5
56			
	15.9	15.7	15.5
60			
	15.8	15.7	15.5
64			
	15.7	15.6	15.5
68			
	15.6	15.6	15.5
72			
	15.6	15.6	15.6
76			
	15.5	15.5	15.6
80			
	15.4	15.5	15.6
84			
	15.3	15.4	15.6
88			
	15.2	15.4	15.6
90			

Subtract from table, back cover

GCT	♈	VENUS −4.3		MARS 1.9		JUPITER −2.5		SATURN 1.1		MOON			
	GHA	GHA	Dec.	GHA	Dec.	GHA	Dec.	GHA	Dec.	GHA	code	Dec.	code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
0	8 55.2	216 03.7	+ 5 37.2	218 45.0	+13 32.8	359 36.3	+ 2 14.1	182 52.0	− 0 16.9	184 19.5	139	− 4 30.6	−158
1	23 57.7	231 05.5	37.5	233 45.9	32.2	14 39.1	14.0	197 54.2	17.0	198 52.4	138	4 46.4	−157
2	39 00.1	246 07.3	37.7	248 46.9	31.7	29 41.8	13.8	212 56.4	17.1	213 25.2	137	5 02.1	−157
3	54 02.6	261 09.0	•• 38.0	263 47.9	•• 31.2	44 44.6	•• 13.7	227 58.6	•• 17.3	227 57.9	137	• 5 17.8	−157
4	69 05.1	276 10.8	38.2	278 48.8	30.7	59 47.4	13.6	243 00.8	17.4	242 30.6	136	5 33.5	−157
5	84 07.5	291 12.6	38.5	293 49.8	30.2	74 50.2	13.4	258 02.9	17.5	257 03.2	136	5 49.2	−156
6	99 10.0	306 14.3	+ 5 38.7	308 50.8	+13 29.6	89 52.9	+ 2 13.3	273 05.1	− 0 17.6	271 35.8	136	− 6 04.8	−157
7	114 12.4	321 16.1	39.0	323 51.7	29.1	104 55.7	13.2	288 07.3	17.7	286 08.4	135	6 20.5	−157
8	129 14.9	336 17.8	39.2	338 52.7	28.6	119 58.5	13.1	303 09.5	17.9	300 40.9	134	6 36.2	−156
9	144 17.4	351 19.5	•• 39.4	353 53.7	•• 28.1	135 01.2	•• 12.9	318 11.7	•• 18.0	315 13.3	134	• 6 51.8	−156
10	159 19.8	6 21.3	39.7	8 54.6	27.6	150 04.0	12.8	333 13.8	18.1	329 45.7	133	7 07.4	−156
11	174 22.3	21 23.0	39.9	23 55.6	27.0	165 06.8	12.7	348 16.0	18.2	344 18.0	132	7 23.0	−155
12	189 24.8	36 24.8	+ 5 40.2	38 56.6	+13 26.5	180 09.6	+ 2 12.5	3 18.2	− 0 18.3	358 50.2	132	− 7 38.5	−156
13	204 27.2	51 26.5	40.4	53 57.5	26.0	195 12.3	12.4	18 20.4	18.5	13 22.4	131	7 54.1	−155
14	219 29.7	66 28.2	40.6	68 58.5	25.5	210 15.1	12.3	33 22.6	18.6	27 54.5	131	8 09.6	−155
15	234 32.2	81 29.9	•• 40.9	83 59.5	•• 24.9	225 17.9	•• 12.1	48 24.7	•• 18.7	42 26.6	130	• 8 25.1	−155
16	249 34.6	96 31.7	41.1	99 00.4	24.4	240 20.7	12.0	63 26.9	18.8	56 58.6	129	8 40.6	−154
17	264 37.1	111 33.4	41.3	114 01.4	23.9	255 23.4	11.9	78 29.1	18.9	71 30.5	129	8 56.0	−154
18	279 39.6	126 35.1	+ 5 41.6	129 02.4	+13 23.4	270 26.2	+ 2 11.7	93 31.3	− 0 19.1	86 02.4	128	− 9 11.4	−154
19	294 42.0	141 36.8	41.8	144 03.3	22.9	285 29.0	11.6	108 33.5	19.2	100 34.2	127	9 26.8	−153
20	309 44.5	156 38.5	42.0	159 04.3	22.3	300 31.8	11.5	123 35.6	19.3	115 05.9	127	9 42.1	−153
21	324 46.9	171 40.2	•• 42.3	174 05.3	•• 21.8	315 34.5	•• 11.3	138 37.8	•• 19.4	129 37.6	126	• 9 57.4	−153
22	339 49.4	186 41.9	42.5	189 06.3	21.3	330 37.3	11.2	153 40.0	19.5	144 09.2	125	10 12.7	−152
23	354 51.9	201 43.6	42.7	204 07.2	20.8	345 40.1	11.1	168 42.2	19.7	158 40.7	124	10 27.9	−152
0	9 54.3	216 45.3	+ 5 42.9	219 08.2	+13 20.3	0 42.8	+ 2 10.9	183 44.4	− 0 19.8	173 12.1	124	−10 43.1	−152
1	24 56.8	231 47.0	43.2	234 09.2	19.7	15 45.6	10.8	198 46.5	19.9	187 43.5	123	10 58.3	−151
2	39 59.3	246 48.7	43.4	249 10.1	19.2	30 48.4	10.7	213 48.7	20.0	202 14.8	122	11 13.4	−151
3	55 01.7	261 50.4	•• 43.6	264 11.1	•• 18.7	45 51.2	•• 10.5	228 50.9	•• 20.2	216 46.0	122	• 11 28.5	−150
4	70 04.2	276 52.0	43.8	279 12.1	18.2	60 53.9	10.4	243 53.1	20.3	231 17.2	120	11 43.5	−150
5	85 06.7	291 53.7	44.0	294 13.0	17.6	75 56.7	10.3	258 55.3	20.4	245 48.2	120	11 58.5	−149
6	100 09.1	306 55.4	+ 5 44.2	309 14.0	+13 17.1	90 59.5	+ 2 10.1	273 57.4	− 0 20.5	260 19.2	119	−12 13.4	−149
7	115 11.6	321 57.0	44.5	324 15.0	16.6	106 02.3	10.0	288 59.6	20.6	274 50.1	118	12 28.3	−148
8	130 14.1	336 58.7	44.7	339 16.0	16.1	121 05.0	09.9	304 01.8	20.8	289 20.9	118	12 43.1	−148
9	145 16.5	352 00.4	•• 44.9	354 16.9	•• 15.5	136 07.8	•• 09.7	319 04.0	•• 20.9	303 51.7	116	• 12 57.9	−147
10	160 19.0	7 02.0	45.1	9 17.9	15.0	151 10.6	09.6	334 06.2	21.0	318 22.3	116	13 12.6	−147
11	175 21.4	22 03.7	45.3	24 18.9	14.5	166 13.4	09.5	349 08.3	21.1	332 52.9	114	13 27.3	−146
12	190 23.9	37 05.4	+ 5 45.5	39 19.8	+13 14.0	181 16.1	+ 2 09.3	4 10.5	− 0 21.2	347 23.3	114	−13 41.9	−145
13	205 26.4	52 07.0	45.7	54 20.8	13.5	196 18.9	09.2	19 12.7	21.4	1 53.7	114	13 56.4	−145
14	220 28.8	67 08.7	45.9	69 21.8	12.9	211 21.7	09.1	34 14.9	21.5	16 24.1	112	14 10.9	−145
15	235 31.3	82 10.3	•• 46.1	84 22.8	•• 12.4	226 24.4	•• 08.9	49 17.1	•• 21.6	30 54.3	111	• 14 25.4	−143
16	250 33.8	97 11.9	46.3	99 23.7	11.9	241 27.2	08.8	64 19.2	21.7	45 24.4	110	14 39.7	−143
17	265 36.2	112 13.6	46.5	114 24.7	11.4	256 30.0	08.7	79 21.4	21.8	59 54.4	110	14 54.0	−142
18	280 38.7	127 15.2	+ 5 46.7	129 25.7	+13 10.8	271 32.8	+ 2 08.6	94 23.6	− 0 22.0	74 24.4	108	−15 08.2	−142
19	295 41.2	142 16.8	46.9	144 26.6	10.3	286 35.5	08.4	109 25.8	22.1	88 54.2	108	15 22.4	−141
20	310 43.6	157 18.5	47.1	159 27.6	09.8	301 38.3	08.3	124 28.0	22.2	103 24.0	107	15 36.5	−140
21	325 46.1	172 20.1	•• 47.3	174 28.6	•• 09.3	316 41.1	•• 08.2	139 30.1	•• 22.3	117 53.7	105	• 15 50.5	−139
22	340 48.5	187 21.7	47.5	189 29.6	08.7	331 43.9	08.0	154 32.3	22.4	132 23.2	105	16 04.4	−139
23	355 51.0	202 23.3	47.7	204 30.5	08.2	346 46.6	07.9	169 34.5	22.6	146 52.7	104	16 18.3	−138
0	10 53.5	217 25.0	+ 5 47.9	219 31.5	+13 07.7	1 49.4	+ 2 07.8	184 36.7	− 0 22.7	161 22.1	103	−16 32.1	−137
1	25 55.9	232 26.6	48.1	234 32.5	07.2	16 52.2	07.6	199 38.9	22.8	175 51.4	102	16 45.8	−136
2	40 58.4	247 28.2	48.3	249 33.5	06.6	31 55.0	07.5	214 41.0	22.9	190 20.6	100	16 59.4	−135
3	56 00.9	262 29.8	•• 48.4	264 34.4	•• 06.1	46 57.7	•• 07.4	229 43.2	•• 23.1	204 49.6	100	• 17 12.9	−135
4	71 03.3	277 31.4	48.6	279 35.4	05.6	62 00.5	07.2	244 45.4	23.2	219 18.6	99	17 26.4	−134
5	86 05.8	292 33.0	48.8	294 36.4	05.1	77 03.3	07.1	259 47.6	23.3	233 47.5	98	17 39.8	−132
6	101 08.3	307 34.6	+ 5 49.0	309 37.4	+13 04.5	92 06.1	+ 2 07.0	274 49.8	− 0 23.4	248 16.3	97	−17 53.0	−132
7	116 10.7	322 36.2	49.2	324 38.3	04.0	107 08.8	06.8	289 51.9	23.5	262 45.0	96	18 06.2	−131
8	131 13.2	337 37.8	49.4	339 39.3	03.5	122 11.6	06.7	304 54.1	23.7	277 13.6	94	18 19.3	−130
9	146 15.7	352 39.4	•• 49.5	354 40.3	•• 03.0	137 14.4	•• 06.6	319 56.3	•• 23.8	291 42.0	94	• 18 32.3	−129
10	161 18.1	7 40.9	49.7	9 41.3	02.4	152 17.1	06.4	334 58.5	23.9	306 10.4	93	18 45.2	−128
11	176 20.6	22 42.5	49.9	24 42.2	01.9	167 19.9	06.3	350 00.7	24.0	320 38.7	92	18 58.0	−128
12	191 23.0	37 44.1	+ 5 50.1	39 43.2	+13 01.4	182 22.7	+ 2 06.2	5 02.8	− 0 24.1	335 06.9	90	−19 10.8	−126
13	206 25.5	52 45.7	50.2	54 44.2	00.9	197 25.5	06.0	20 05.0	24.3	349 34.9	90	19 23.4	−125
14	221 28.0	67 47.2	50.4	69 45.2	13 00.3	212 28.2	05.9	35 07.2	24.4	4 02.9	89	19 35.9	−124
15	236 30.4	82 48.8	•• 50.6	84 46.1	• 12 59.8	227 31.0	•• 05.8	50 09.4	•• 24.5	18 30.8	87	• 19 48.3	−123
16	251 32.9	97 50.4	50.8	99 47.1	59.3	242 33.8	05.7	65 11.6	24.6	32 58.5	87	20 00.6	−122
17	266 35.4	112 51.9	50.9	114 48.1	58.8	257 36.6	05.5	80 13.7	24.7	47 26.2	85	20 12.8	−120
18	281 37.8	127 53.5	+ 5 51.1	129 49.1	+12 58.2	272 39.3	+ 2 05.4	95 15.9	− 0 24.9	61 53.7	84	−20 24.8	−120
19	296 40.3	142 55.1	51.2	144 50.0	57.7	287 42.1	05.3	110 18.1	25.0	76 21.1	84	20 36.8	−119
20	311 42.8	157 56.6	51.4	159 51.0	57.2	302 44.9	05.1	125 20.3	25.1	90 48.5	82	20 48.7	−117
21	326 45.2	172 58.2	•• 51.6	174 52.0	•• 56.7	317 47.7	•• 05.0	140 22.5	•• 25.2	105 15.7	81	• 21 00.4	−116
22	341 47.7	187 59.7	51.7	189 53.0	56.1	332 50.4	04.9	155 24.6	25.3	119 42.8	80	21 12.0	−115
23	356 50.1	203 01.3	51.9	204 53.9	55.6	347 53.2	04.7	170 26.8	25.5	134 09.8	79	21 23.5	−114
24	11 52.6	218 02.8	+ 5 52.1	219 54.9	+12 55.1	2 56.0	+ 2 04.6	185 29.0	− 0 25.6	148 36.7	78	−21 34.9	−113
code	—	+ 16	+ 2	+ 10	− 5	+ 28	− 1	+ 22	− 2				

SUN

GCT	GHA	Dec.
h	° ′	° ′
0	182 29.3	− 2 46.9
1	197 29.5	47.9
2	212 29.7	48.9
3	227 29.9	·· 49.9
4	242 30.1	50.8
5	257 30.3	51.8
6	272 30.5	− 2 52.8
7	287 30.7	53.8
8	302 30.9	54.7
9	317 31.1	·· 55.7
10	332 31.3	56.7
11	347 31.5	57.6
12	2 31.7	− 2 58.6
13	17 31.9	2 59.6
14	32 32.1	3 00.6
15	47 32.3	·· 01.5
16	62 32.5	02.5
17	77 32.7	03.5
18	92 32.9	− 3 04.4
19	107 33.1	05.4
20	122 33.3	06.4
21	137 33.5	·· 07.4
22	152 33.7	08.3
23	167 33.9	09.3
0	182 34.1	− 3 10.3
1	197 34.3	11.2
2	212 34.5	12.2
3	227 34.7	·· 13.2
4	242 34.9	14.2
5	257 35.1	15.1
6	272 35.3	− 3 16.1
7	287 35.5	17.1
8	302 35.7	18.0
9	317 35.9	·· 19.0
10	332 36.1	20.0
11	347 36.3	20.9
12	2 36.5	− 3 21.9
13	17 36.7	22.9
14	32 36.9	23.9
15	47 37.1	·· 24.8
16	62 37.3	25.8
17	77 37.5	26.8
18	92 37.7	− 3 27.7
19	107 37.9	28.7
20	122 38.1	29.7
21	137 38.3	·· 30.6
22	152 38.5	31.6
23	167 38.7	32.6
0	182 38.9	− 3 33.6
1	197 39.1	34.5
2	212 39.3	35.5
3	227 39.5	·· 36.5
4	242 39.7	37.4
5	257 39.9	38.4
6	272 40.1	− 3 39.4
7	287 40.3	40.3
8	302 40.4	41.3
9	317 40.6	·· 42.3
10	332 40.8	43.2
11	347 41.0	44.2
12	2 41.2	− 3 45.2
13	17 41.4	46.1
14	32 41.6	47.1
15	47 41.8	·· 48.1
16	62 42.0	49.1
17	77 42.2	50.0
18	92 42.4	− 3 51.0
19	107 42.6	52.0
20	122 42.8	52.9
21	137 43.0	·· 53.9
22	152 43.2	54.9
23	167 43.4	55.8
24	182 43.6	− 3 56.8
code	—	− 10

STARS

No.	SHA	Dec.	Transit Mer. Gr.
	° ′	° ′	h m
1	358 31.3	+28 49.6	23 22
2	358 20.7	+58 53.2	23 23
3	349 42.0	−18 14.9	0 02
4	339 19.9	+59 59.2	0 43
5	336 00.4	−57 28.6	0 56
6	332 19.6	+89 02.3	1 11
7	328 52.9	+23 14.3	1 25
8	315 53.0	−40 29.5	2 16
9	309 46.6	+49 41.5	2 41
10	291 42.5	+16 25.0	3 53
11	281 56.5	− 8 15.0	4 32
12	281 42.9	+45 57.1	4 33
13	279 21.7	+ 6 18.7	4 42
14	279 11.2	+28 34.2	4 43
15	276 33.4	− 1 13.6	4 53
16	271 51.5	+ 7 24.2	5 12
17	264 16.8	−52 39.6	5 42
18	259 14.6	−16 38.5	6 02
19	255 49.1	−28 53.9	6 16
20	245 48.3	+ 5 21.2	6 56
21	244 24.5	+28 08.8	7 02
22	234 37.5	−59 20.8	7 41
23	223 27.0	−43 13.9	8 25
24	221 50.6	−69 30.7	8 32
25	218 41.9	− 8 26.7	8 44
26	208 33.1	+12 12.4	9 25
27	194 48.7	+62 00.7	10 19
28	183 21.2	+14 50.6	11 05
29	174 02.3	−62 49.9	11 42
30	172 53.6	−56 50.6	11 47
31	168 47.5	−59 25.5	12 03
32	167 01.6	+56 13.3	12 10
33	159 30.5	+55 10.6	12 40
34	159 20.5	−10 54.6	12 41
35	153 35.6	+49 33.3	13 04
36	149 02.8	−36 08.1	13 22
37	146 38.3	+19 26.0	13 32
38	140 56.1	−60 38.5	13 54
39	137 18.3	+74 21.2	14 09
40	126 50.5	+26 52.6	14 51
41	120 38.0	−22 29.3	15 15
42	113 23.4	−26 19.7	15 44
43	109 07.3	−68 56.9	16 01
44	103 05.9	−15 40.1	16 25
45	97 25.1	−37 04.5	16 48
46	96 49.6	+12 35.7	16 50
47	91 07.8	+51 29.8	17 13
48	84 45.4	−34 24.8	17 38
49	81 10.4	+38 44.4	17 53
50	76 55.7	−26 21.7	18 10
51	62 53.4	+ 8 44.4	19 06
52	54 31.8	−56 53.8	19 39
53	50 03.0	+45 06.6	19 57
54	34 32.5	+ 9 39.3	20 59
55	28 41.4	−47 11.8	21 22
56	16 14.7	−29 52.7	22 12
57	14 24.3	+14 56.9	22 19

Sunrise, Twilight, Moonrise

Lat.	Sunrise	Twlt. begins	Moonrise 1	Moonrise 2	Moonrise 3	Moonrise 4
N °	h m	h m	h m	h m	h m	h m
70	6 17	2 32	7 09	9 26	12 46	■
68	6 14	2 54	7 01	9 06	11 38	■
66	6 11	3 10	6 54	8 50	11 02	■
64	6 09	3 23	6 49	8 37	10 37	12 58
62	6 08	3 34	6 44	8 26	10 17	12 19
60	6 06	3 43	6 40	8 17	10 01	11 52
58	6 05	3 49	6 36	8 09	9 48	11 31
56	6 03	3 56	6 33	8 02	9 36	11 13
54	6 02	4 01	6 30	7 56	9 26	10 59
52	6 01	4 07	6 27	7 50	9 17	10 46
50	6 00	4 11	6 25	7 45	9 09	10 35
45	5 58	4 19	6 20	7 34	8 52	10 12
40	5 56	4 25	6 16	7 25	8 38	9 54
35	5 55	4 30	6 12	7 18	8 27	9 38
30	5 53	4 34	6 09	7 11	8 17	9 25
20	5 51	4 38	6 03	7 00	7 59	9 02
10	5 49	4 39	5 58	6 50	7 45	8 43
0	5 46	4 38	5 54	6 41	7 31	8 25
10	5 44	4 34	5 50	6 32	7 17	8 07
20	5 41	4 28	5 45	6 22	7 02	7 48
30	5 38	4 18	5 40	6 11	6 46	7 26
35	5 36	4 12	5 37	6 05	6 36	7 14
40	5 34	4 04	5 33	5 58	6 25	6 59
45	5 32	3 53	5 30	5 49	6 13	6 42
50	5 29	3 38	5 25	5 40	5 57	6 21
52	5 27	3 32	5 23	5 35	5 50	6 11
54	5 26	3 23	5 21	5 30	5 42	6 00
56	5 24	3 14	5 18	5 25	5 34	5 47
58	5 22	3 02	5 15	5 19	5 24	5 33
60	5 20	2 49	5 12	5 12	5 12	5 15
S						

Sunset, Twilight, Moonset

Lat.	Sunset	Twlt. ends	Moonset 1	Moonset 2	Moonset 3	Moonset 4
N °	h m	h m	h m	h m	h m	h m
70	17 21	20 59	16 31	15 52	14 19	■
68	17 24	20 39	16 41	16 15	15 29	■
66	17 26	20 23	16 50	16 32	16 06	■
64	17 28	20 11	16 57	16 47	16 33	16 06
62	17 30	20 01	17 04	16 59	16 53	16 46
60	17 32	19 53	17 10	17 09	17 10	17 14
58	17 33	19 45	17 15	17 18	17 25	17 36
56	17 35	19 40	17 19	17 26	17 37	17 54
54	17 36	19 35	17 23	17 34	17 48	18 09
52	17 37	19 30	17 27	17 40	17 58	18 22
50	17 38	19 26	17 30	17 46	18 06	18 34
45	17 40	19 18	17 38	17 59	18 25	18 58
40	17 42	19 12	17 44	18 09	18 40	19 17
35	17 44	19 08	17 49	18 18	18 53	19 34
30	17 45	19 04	17 54	18 26	19 04	19 48
20	17 48	19 01	18 02	18 40	19 23	20 12
10	17 50	19 00	18 09	18 52	19 40	20 33
0	17 53	19 02	18 16	19 04	19 56	20 53
10	17 55	19 05	18 23	19 15	20 12	21 12
20	17 58	19 12	18 30	19 28	20 29	21 33
30	18 02	19 23	18 38	19 42	20 49	21 58
35	18 04	19 30	18 43	19 50	21 01	22 12
40	18 06	19 38	18 49	20 00	21 14	22 29
45	18 08	19 49	18 55	20 11	21 30	22 50
50	18 12	20 05	19 03	20 25	21 50	23 15
52	18 13	20 12	19 06	20 31	21 59	23 27
54	18 15	20 21	19 10	20 38	22 10	23 42
56	18 16	20 30	19 15	20 46	22 22	23 58
58	18 18	20 42	19 20	20 55	22 36	24 18
60	18 21	20 56	19 25	21 05	22 52	24 44
S						

Equation of Time (App.—Mean)

GCT	1	2	3
h	m s	m s	m s
0	+ 9 56.7	+10 16.0	+10 35.1
6	+10 01.5	+10 20.8	+10 39.8
12	+10 06.4	+10 25.6	+10 44.5
18	+10 11.2	+10 30.4	+10 49.2
24	+10 16.0	+10 35.1	+10 53.9

GCT of Transit Meridian of Greenwich

DAY	Moon	Venus	Mars	Jupiter	Saturn
	h m	h m	h m	h m	h m
1	12 05	9 35	9 24	0 02 / 23 57	11 47
2	12 52	9 32	9 23	23 53	11 43
3	13 43	9 29	9 21	23 48	11 40
4	14 39	9 27	9 20	23 44	11 36

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb	Venus	Mars
°	′	′	′
0–30	0.3	0.4	0.1
30–45	0.3	0.3	0.1
45–60	0.3	0.2	0.0
60–75	0.3	0.1	0.0
75–90	0.3	0.1	0.0

Moon's Lower Limb

Add

Alt.	1	2	3
°	′	′	′
0–4	16.4	17.1	17.6
4–8	16.4	17.1	17.6
8–12	16.4	17.1	17.6
12–16	16.4	17.0	17.5
16–20	16.4	17.0	17.5
20–24	16.4	17.0	17.5
24–28	16.4	17.0	17.4
28–32	16.3	16.9	17.4
32–36	16.3	16.9	17.3
36–40	16.3	16.8	17.2
40–44	16.3	16.8	17.2
44–48	16.2	16.7	17.1
48–52	16.2	16.6	17.0
52–56	16.2	16.6	16.9
56–60	16.1	16.5	16.8
60–64	16.1	16.4	16.7
64–68	16.0	16.4	16.6
68–72	16.0	16.3	16.5
72–76	15.9	16.2	16.4
76–80	15.9	16.1	16.3
80–84	15.8	16.0	16.2
84–88	15.8	16.0	16.1
88–90	15.8	15.9	16.0

Add to table, back cover

Moon's Upper Limb

Subtract

Alt.	1	2	3
°	′	′	′
0–4	15.0	14.7	14.4
4–8	15.0	14.7	14.4
8–12	15.1	14.7	14.4
12–16	15.1	14.7	14.4
16–20	15.1	14.7	14.5
20–24	15.1	14.8	14.5
24–28	15.1	14.8	14.5
28–32	15.1	14.8	14.6
32–36	15.2	14.9	14.7
36–40	15.2	14.9	14.7
40–44	15.2	15.0	14.8
44–48	15.3	15.0	14.9
48–52	15.3	15.1	15.0
52–56	15.3	15.2	15.0
56–60	15.4	15.2	15.1
60–64	15.4	15.3	15.2
64–68	15.5	15.4	15.3
68–72	15.5	15.5	15.4
72–76	15.5	15.5	15.5
76–80	15.6	15.6	15.7
80–84	15.6	15.7	15.8
84–88	15.7	15.8	15.9
88–90	15.7	15.9	16.0

Subtract from table, back cover

Hebrew New Year (Rosh Hashanah) 1

New Moon 1

GCT	♈ GHA	VENUS −4.3 GHA	Dec.	MARS 1.9 GHA	Dec.	JUPITER −2.5 GHA	Dec.	SATURN 1.1 GHA	Dec.	MOON GHA	code	Dec.	code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
0	11 52.6	218 02.8	+ 5 52.1	219 54.9	+12 55.1	2 56.0	+ 2 04.6	185 29.0	− 0 25.6	148 36.7	78	−21 34.9	−113
1	26 55.1	233 04.3	52.2	234 55.9	54.5	17 58.7	04.5	200 31.2	25.7	163 03.5	77	21 46.2	−111
2	41 57.5	248 05.9	52.4	249 56.9	54.0	33 01.5	04.3	215 33.4	25.8	177 30.2	76	21 57.3	−110
3	57 00.0	263 07.4	·· 52.5	264 57.9	·· 53.5	48 04.3	·· 04.2	230 35.6	·· 25.9	191 56.8	75	·22 08.3	−109
4	72 02.5	278 08.9	52.7	279 58.8	53.0	63 07.1	04.1	245 37.7	26.1	206 23.3	74	22 19.2	−108
5	87 04.9	293 10.5	52.8	294 59.8	52.4	78 09.8	03.9	260 39.9	26.2	220 49.7	72	22 30.0	−106
6	102 07.4	308 12.0	+ 5 53.0	310 00.8	+12 51.9	93 12.6	+ 2 03.8	275 42.1	− 0 26.3	235 15.9	72	−22 40.6	−105
7	117 09.9	323 13.5	53.1	325 01.8	51.4	108 15.4	03.7	290 44.3	26.4	249 42.1	70	22 51.1	−104
8	132 12.3	338 15.0	53.3	340 02.7	50.8	123 18.2	03.5	305 46.5	26.5	264 08.1	70	23 01.5	−102
9	147 14.8	353 16.5	·· 53.4	355 03.7	·· 50.3	138 20.9	·· 03.4	320 48.6	·· 26.7	278 34.1	68	·23 11.7	−101
10	162 17.3	8 18.0	53.6	10 04.7	49.8	153 23.7	03.3	335 50.8	26.8	292 59.9	68	23 21.8	− 99
11	177 19.7	23 19.5	53.7	25 05.7	49.3	168 26.5	03.1	350 53.0	26.9	307 25.7	66	23 31.7	− 98
12	192 22.2	38 21.1	+ 5 53.9	40 06.7	+12 48.7	183 29.3	+ 2 03.0	5 55.2	− 0 27.0	321 51.3	66	−23 41.5	− 97
13	207 24.6	53 22.6	54.0	55 07.6	48.2	198 32.0	02.9	20 57.4	27.1	336 16.9	64	23 51.2	− 95
14	222 27.1	68 24.1	54.1	70 08.6	47.7	213 34.8	02.8	35 59.5	27.3	350 42.3	63	24 00.7	− 94
15	237 29.6	83 25.5	·· 54.3	85 09.6	·· 47.2	228 37.6	·· 02.6	51 01.7	·· 27.4	5 07.6	63	·24 10.1	− 92
16	252 32.0	98 27.0	54.4	100 10.6	46.6	243 40.4	02.5	66 03.9	27.5	19 32.9	61	24 19.3	− 91
17	267 34.5	113 28.5	54.5	115 11.6	46.1	258 43.1	02.4	81 06.1	27.6	33 58.0	60	24 28.4	− 89
18	282 37.0	128 30.0	+ 5 54.7	130 12.5	+12 45.6	273 45.9	+ 2 02.2	96 08.3	− 0 27.7	48 23.0	60	−24 37.3	− 88
19	297 39.4	143 31.5	54.8	145 13.5	45.0	288 48.7	02.1	111 10.4	27.9	62 48.0	58	24 46.1	− 86
20	312 41.9	158 33.0	54.9	160 14.5	44.5	303 51.4	02.0	126 12.6	28.0	77 12.8	58	24 54.7	− 85
21	327 44.4	173 34.5	·· 55.1	175 15.5	·· 44.0	318 54.2	·· 01.8	141 14.8	·· 28.1	91 37.6	56	·25 03.2	− 83
22	342 46.8	188 35.9	55.2	190 16.5	43.4	333 57.0	01.7	156 17.0	28.2	106 02.2	56	25 11.5	− 81
23	357 49.3	203 37.4	55.3	205 17.5	42.9	348 59.8	01.6	171 19.2	28.4	120 26.8	54	25 19.6	− 80
0	12 51.8	218 38.9	+ 5 55.5	220 18.4	+12 42.4	4 02.5	+ 2 01.4	186 21.3	− 0 28.5	134 51.2	54	−25 27.6	− 78
1	27 54.2	233 40.3	55.6	235 19.4	41.9	19 05.3	01.3	201 23.5	28.6	149 15.6	53	25 35.4	− 77
2	42 56.7	248 41.8	55.7	250 20.4	41.3	34 08.1	01.2	216 25.7	28.7	163 39.9	51	25 43.1	− 75
3	57 59.1	263 43.3	·· 55.8	265 21.4	·· 40.8	49 10.9	·· 01.0	231 27.9	·· 28.8	178 04.0	51	·25 50.6	− 73
4	73 01.6	278 44.7	56.0	280 22.4	40.3	64 13.6	00.9	246 30.1	29.0	192 28.1	50	25 57.9	− 72
5	88 04.1	293 46.2	56.1	295 23.3	39.7	79 16.4	00.8	261 32.2	29.1	206 52.1	50	26 05.1	− 70
6	103 06.5	308 47.6	+ 5 56.2	310 24.3	+12 39.2	94 19.2	+ 2 00.6	276 34.4	− 0 29.2	221 16.1	48	−26 12.1	− 68
7	118 09.0	323 49.1	56.3	325 25.3	38.7	109 22.0	00.5	291 36.6	29.3	235 39.9	48	26 18.9	− 66
8	133 11.5	338 50.5	56.4	340 26.3	38.2	124 24.7	00.4	306 38.8	29.4	250 03.7	47	26 25.5	− 65
9	148 13.9	353 52.0	·· 56.5	355 27.3	·· 37.6	139 27.5	·· 00.3	321 41.0	·· 29.6	264 27.4	46	·26 32.0	− 63
10	163 16.4	8 53.4	56.7	10 28.3	37.1	154 30.3	00.1	336 43.1	29.7	278 51.0	45	26 38.3	− 61
11	178 18.9	23 54.8	56.8	25 29.2	36.6	169 33.0	2 00.0	351 45.3	29.8	293 14.5	44	26 44.4	− 60
12	193 21.3	38 56.3	+ 5 56.9	40 30.2	+12 36.0	184 35.8	+ 1 59.9	6 47.5	− 0 29.9	307 37.9	44	−26 50.4	− 58
13	208 23.8	53 57.7	57.0	55 31.2	35.5	199 38.6	59.7	21 49.7	30.0	322 01.3	43	26 56.2	− 56
14	223 26.3	68 59.1	57.1	70 32.2	35.0	214 41.4	59.6	36 51.9	30.2	336 24.6	43	27 01.8	− 54
15	238 28.7	84 00.6	·· 57.2	85 33.2	·· 34.4	229 44.1	·· 59.5	51 54.0	·· 30.3	350 47.9	41	·27 07.2	− 52
16	253 31.2	99 02.0	57.3	100 34.2	33.9	244 46.9	59.3	66 56.2	30.4	5 11.0	41	27 12.4	− 51
17	268 33.6	114 03.4	57.4	115 35.1	33.4	259 49.7	59.2	81 58.4	30.5	19 34.1	41	27 17.5	− 48
18	283 36.1	129 04.8	+ 5 57.5	130 36.1	+12 32.8	274 52.5	+ 1 59.1	97 00.6	− 0 30.6	33 57.2	39	−27 22.3	− 47
19	298 38.6	144 06.2	57.6	145 37.1	32.3	289 55.2	58.9	112 02.8	30.8	48 20.1	39	27 27.0	− 45
20	313 41.0	159 07.7	57.7	160 38.1	31.8	304 58.0	58.8	127 04.9	30.9	62 43.0	39	27 31.5	− 43
21	328 43.5	174 09.1	·· 57.8	175 39.1	·· 31.2	320 00.8	·· 58.7	142 07.1	·· 31.0	77 05.9	38	·27 35.8	− 41
22	343 46.0	189 10.5	57.9	190 40.1	30.7	335 03.5	58.6	157 09.3	31.1	91 28.7	37	27 39.9	− 40
23	358 48.4	204 11.9	58.0	205 41.1	30.2	350 06.3	58.4	172 11.5	31.2	105 51.4	37	27 43.9	− 37
0	13 50.9	219 13.3	+ 5 58.1	220 42.0	+12 29.7	5 09.1	+ 1 58.3	187 13.7	− 0 31.4	120 14.1	37	−27 47.6	− 36
1	28 53.4	234 14.7	58.2	235 43.0	29.1	20 11.9	58.2	202 15.9	31.5	134 36.8	36	27 51.2	− 33
2	43 55.8	249 16.1	58.3	250 44.0	28.6	35 14.6	58.0	217 18.0	31.6	148 59.4	36	27 54.5	− 32
3	58 58.3	264 17.4	·· 58.4	265 45.0	·· 28.1	50 17.4	·· 57.9	232 20.2	·· 31.7	163 22.0	35	·27 57.7	− 30
4	74 00.7	279 18.8	58.5	280 46.0	27.5	65 20.2	57.8	247 22.4	31.8	177 44.5	35	28 00.7	− 28
5	89 03.2	294 20.2	58.6	295 47.0	27.0	80 23.0	57.6	262 24.6	32.0	192 07.0	34	28 03.5	− 26
6	104 05.7	309 21.6	+ 5 58.7	310 48.0	+12 26.5	95 25.7	+ 1 57.5	277 26.8	− 0 32.1	206 29.4	34	−28 06.1	− 24
7	119 08.1	324 23.0	58.7	325 48.9	25.9	110 28.5	57.4	292 28.9	32.2	220 51.8	34	28 08.5	− 22
8	134 10.6	339 24.4	58.8	340 49.9	25.4	125 31.3	57.2	307 31.1	32.3	235 14.2	33	28 10.7	− 20
9	149 13.1	354 25.7	·· 58.9	355 50.9	·· 24.9	140 34.0	·· 57.1	322 33.3	·· 32.4	249 36.5	34	·28 12.7	− 18
10	164 15.5	9 27.1	59.0	10 51.9	24.3	155 36.8	57.0	337 35.5	32.6	263 58.9	33	28 14.5	− 17
11	179 18.0	24 28.5	59.1	25 52.9	23.8	170 39.6	56.9	352 37.7	32.7	278 21.2	32	28 16.2	− 14
12	194 20.5	39 29.8	+ 5 59.1	40 53.9	+12 23.3	185 42.4	+ 1 56.7	7 39.8	− 0 32.8	292 43.4	33	−28 17.6	− 12
13	209 22.9	54 31.2	59.2	55 54.9	22.7	200 45.1	56.6	22 42.0	32.9	307 05.7	32	28 18.8	− 11
14	224 25.4	69 32.6	59.3	70 55.9	22.2	215 47.9	56.5	37 44.2	33.0	321 27.9	33	28 19.9	− 8
15	239 27.9	84 33.9	·· 59.4	85 56.9	·· 21.7	230 50.7	·· 56.3	52 46.4	·· 33.2	335 50.2	32	·28 20.7	− 6
16	254 30.3	99 35.3	59.4	100 57.8	21.1	245 53.5	56.2	67 48.6	33.3	350 12.4	32	28 21.3	− 5
17	269 32.8	114 36.6	59.5	115 58.8	20.6	260 56.2	56.1	82 50.7	33.4	4 34.6	32	28 21.8	− 2
18	284 35.2	129 38.0	+ 5 59.6	130 59.8	+12 20.1	275 59.0	+ 1 55.9	97 52.9	− 0 33.5	18 56.8	32	−28 22.0	− 1
19	299 37.7	144 39.3	59.7	146 00.8	19.5	291 01.8	55.8	112 55.1	33.6	33 19.0	32	28 22.1	+ 2
20	314 40.2	159 40.7	59.7	161 01.8	19.0	306 04.5	55.7	127 57.3	33.8	47 41.2	32	28 21.9	+ 3
21	329 42.6	174 42.0	·· 59.8	176 02.8	·· 18.5	321 07.3	·· 55.6	142 59.5	·· 33.9	62 03.4	32	·28 21.6	+ 5
22	344 45.1	189 43.4	59.9	191 03.8	17.9	336 10.1	55.4	158 01.6	34.0	76 25.6	32	28 21.1	+ 8
23	359 47.6	204 44.7	5 59.9	206 04.8	17.4	351 12.9	55.3	173 03.8	34.1	90 47.8	33	28 20.3	+ 9
24	14 50.0	219 46.0	+ 6 00.0	221 05.8	+12 16.9	6 15.6	+ 1 55.2	188 06.0	− 0 34.2	105 10.1	32	−28 19.4	+ 12
code	—	+ 14	+ 1	+ 10	− 5	+ 28	− 2	+ 22	− 1				

G C T	SUN GHA	SUN Dec.
h	° ′	° ′
0	182 43.6	− 3 56.8
1	197 43.8	57.8
2	212 44.0	58.7
3	227 44.1	· 3 59.7
4	242 44.3	4 00.7
5	257 44.5	01.6
6	272 44.7	− 4 02.6
7	287 44.9	03.6
8	302 45.1	04.5
9	317 45.3	·· 05.5
10	332 45.5	06.5
11	347 45.7	07.4
12	2 45.9	− 4 08.4
13	17 46.1	09.4
14	32 46.3	10.3
15	47 46.5	·· 11.3
16	62 46.7	12.3
17	77 46.8	13.2
18	92 47.0	− 4 14.2
19	107 47.2	15.2
20	122 47.4	16.1
21	137 47.6	·· 17.1
22	152 47.8	18.1
23	167 48.0	19.0
0	182 48.2	− 4 20.0
1	197 48.4	21.0
2	212 48.6	21.9
3	227 48.7	·· 22.9
4	242 48.9	23.9
5	257 49.1	24.8
6	272 49.3	− 4 25.8
7	287 49.5	26.7
8	302 49.7	27.7
9	317 49.9	·· 28.7
10	332 50.1	29.6
11	347 50.3	30.6
12	2 50.5	− 4 31.6
13	17 50.6	32.5
14	32 50.8	33.5
15	47 51.0	·· 34.5
16	62 51.2	35.4
17	77 51.4	36.4
18	92 51.6	− 4 37.4
19	107 51.8	38.3
20	122 52.0	39.3
21	137 52.1	·· 40.2
22	152 52.3	41.2
23	167 52.5	42.2
0	182 52.7	− 4 43.1
1	197 52.9	44.1
2	212 53.1	45.1
3	227 53.3	·· 46.0
4	242 53.5	47.0
5	257 53.6	47.9
6	272 53.8	− 4 48.9
7	287 54.0	49.9
8	302 54.2	50.8
9	317 54.4	·· 51.8
10	332 54.6	52.8
11	347 54.8	53.7
12	2 54.9	− 4 54.7
13	17 55.1	55.6
14	32 55.3	56.6
15	47 55.5	·· 57.6
16	62 55.7	58.5
17	77 55.9	4 59.5
18	92 56.0	− 5 00.5
19	107 56.2	01.4
20	122 56.4	02.4
21	137 56.6	·· 03.3
22	152 56.8	04.3
23	167 57.0	05.3
24	182 57.1	− 5 06.2
code	—	− 9

STARS No.	SHA	Dec.	Transit Mer. Gr.
	° ′	° ′	h m
1	358 31.3	+28 49.6	23 11
2	358 20.7	+58 53.2	23 11
3	349 42.0	−18 14.9	23 46
4	339 19.9	+59 59.2	0 31
5	336 00.3	−57 28.7	0 44
6	332 19.1	+89 02.3	0 59
7	328 52.9	+23 14.3	1 13
8	315 53.0	−40 29.5	2 05
9	309 46.6	+49 41.6	2 29
10	291 42.5	+16 25.0	3 41
11	281 56.5	− 8 15.0	4 20
12	281 42.9	+45 57.1	4 21
13	279 21.7	+ 6 18.7	4 30
14	279 11.2	+28 34.2	4 31
15	276 33.4	− 1 13.6	4 42
16	271 51.4	+ 7 24.2	5 00
17	264 16.7	−52 39.6	5 31
18	259 14.6	−16 38.5	5 51
19	255 49.0	−28 53.9	6 04
20	245 48.3	+ 5 21.2	6 44
21	244 24.5	+28 08.8	6 50
22	234 37.5	−59 20.8	7 29
23	223 27.0	−43 13.9	8 13
24	221 50.6	−69 30.7	8 20
25	218 41.9	− 8 26.7	8 32
26	208 33.1	+12 12.4	9 13
27	194 48.7	+62 00.6	10 08
28	183 21.2	+14 50.6	10 53
29	174 02.3	−62 49.9	11 31
30	172 53.6	−56 50.6	11 35
31	168 47.5	−59 25.5	11 51
32	167 01.6	+56 13.3	11 58
33	159 30.5	+55 10.6	12 28
34	159 20.5	−10 54.6	12 29
35	153 35.6	+49 33.3	12 52
36	149 02.8	−36 08.1	13 10
37	146 38.3	+19 26.0	13 20
38	140 56.1	−60 38.5	13 43
39	137 18.3	+74 21.2	13 57
40	126 50.5	+26 52.6	14 39
41	120 38.0	−22 29.3	15 04
42	113 23.5	−26 19.7	15 32
43	109 07.3	−68 56.9	15 49
44	103 05.9	−15 40.1	16 13
45	97 25.1	−37 04.5	16 36
46	96 49.6	+12 35.7	16 39
47	91 07.8	+51 29.8	17 01
48	84 45.4	−34 24.8	17 27
49	81 10.4	+38 44.4	17 41
50	76 55.8	−26 21.7	17 58
51	62 53.4	+ 8 44.4	18 54
52	54 31.9	−56 53.8	19 27
53	50 03.0	+45 06.6	19 45
54	34 32.5	+ 9 39.3	20 47
55	28 41.4	−47 11.8	21 10
56	16 14.7	−29 52.7	22 00
57	14 24.3	+14 56.9	22 07

Lat.	Sunrise	Twlt. begins	Moonrise 4	Moonrise 5	Moonrise 6	Moonrise 7
N °	h m	h m	h m	h m	h m	h m
70	6 28	2 49	■	■	■	■
68	6 24	3 08	■	■	■	■
66	6 21	3 22	■	■	■	■
64	6 18	3 33	12 58	■	■	■
62	6 15	3 43	12 19	14 38	■	17 06
60	6 13	3 51	11 52	13 45	15 18	16 03
58	6 11	3 57	11 31	13 13	14 37	15 29
56	6 09	4 02	11 13	12 49	14 09	15 03
54	6 08	4 08	10 59	12 29	13 47	14 43
52	6 06	4 12	10 46	12 13	13 29	14 26
50	6 05	4 15	10 35	11 59	13 13	14 12
45	6 02	4 23	10 12	11 31	12 42	13 42
40	5 59	4 28	9 54	11 09	12 18	13 19
35	5 57	4 32	9 38	10 50	11 59	13 00
30	5 55	4 36	9 25	10 34	11 42	12 43
20	5 52	4 38	9 02	10 08	11 13	12 15
10	5 48	4 38	8 43	9 45	10 49	11 51
0	5 45	4 37	8 25	9 24	10 26	11 29
10	5 42	4 33	8 07	9 03	10 03	11 06
20	5 39	4 26	7 48	8 40	9 39	10 42
30	5 35	4 15	7 26	8 14	9 11	10 14
35	5 32	4 07	7 14	7 59	8 54	9 58
40	5 29	3 58	6 59	7 42	8 35	9 39
45	5 26	3 46	6 42	7 21	8 11	9 15
50	5 22	3 30	6 21	6 54	7 41	8 45
52	5 20	3 23	6 11	6 41	7 26	8 30
54	5 18	3 14	6 00	6 27	7 09	8 13
56	5 16	3 03	5 47	6 10	6 48	7 52
58	5 14	2 50	5 33	5 49	6 22	7 26
60	5 11	2 36	5 15	5 23	5 47	6 49
S						

Lat.	Sunset	Twlt. ends	Moonset 4	Moonset 5	Moonset 6	Moonset 7
N °	h m	h m	h m	h m	h m	h m
70	17 07	20 40	■	■	■	■
68	17 11	20 23	■	■	■	■
66	17 15	20 10	■	■	■	■
64	17 18	19 59	16 06	■	■	■
62	17 21	19 51	16 46	16 32	■	18 27
60	17 23	19 43	17 14	17 26	18 03	19 30
58	17 25	19 37	17 36	17 58	18 44	20 04
56	17 27	19 31	17 54	18 22	19 12	20 29
54	17 29	19 27	18 09	18 42	19 34	20 49
52	17 30	19 22	18 22	18 58	19 53	21 06
50	17 32	19 20	18 34	19 13	20 08	21 20
45	17 35	19 13	18 58	19 42	20 39	21 49
40	17 37	19 07	19 17	20 04	21 03	22 12
35	17 40	19 04	19 34	20 23	21 23	22 31
30	17 42	19 01	19 48	20 40	21 40	22 47
20	17 45	18 58	20 12	21 07	22 09	23 14
10	17 49	18 59	20 33	21 31	22 33	23 37
0	17 52	19 01	20 53	21 53	22 56	23 58
10	17 55	19 05	21 12	22 15	23 19	24 20
20	17 59	19 13	21 33	22 39	23 43	24 43
30	18 03	19 24	21 58	23 07	24 11	0 11
35	18 06	19 32	22 12	23 23	24 28	0 28
40	18 09	19 42	22 29	23 42	24 48	0 48
45	18 12	19 54	22 50	24 05	0 05	1 11
50	18 16	20 10	23 15	24 35	0 35	1 42
52	18 18	20 19	23 27	24 50	0 50	1 57
54	18 20	20 28	23 42	25 07	1 07	2 14
56	18 22	20 39	23 58	25 27	1 27	2 35
58	18 25	20 52	24 18	0 18	1 53	3 02
60	18 28	21 08	24 44	0 44	2 29	3 38
S						

G C T	Equation of Time (App.—Mean) 4	5	6
h	m s	m s	m s
0	+10 53.9	+11 12.3	+11 30.5
6	+10 58.5	+11 16.9	+11 34.9
12	+11 03.2	+11 21.4	+11 39.4
18	+11 07.8	+11 26.0	+11 43.8
24	+11 12.3	+11 30.5	+11 48.2

GCT of Transit Meridian of Greenwich

DAY	Moon	Venus	Mars	Jupiter	Saturn
	h m	h m	h m	h m	h m
4	14 39	9 27	9 20	23 44	11 36
5	15 38	9 25	9 18	23 39	11 33
6	16 41	9 22	9 17	23 35	11 29
7	17 44	9 20	9 15	23 31	11 26

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb	Venus	Mars
°	′	′	′
0			
30	0.3	0.4	0.1
45	0.3	0.3	0.1
60	0.3	0.2	0.0
75	0.3	0.1	0.0
90	0.3	0.0	0.0

Moon's Lower Limb
Add

Alt.	4	5	6
°	′	′	′
0			
4	18.0	18.2	18.5
8	18.0	18.2	18.5
12	17.9	18.2	18.4
16	17.9	18.2	18.4
20	17.9	18.1	18.4
24	17.8	18.1	18.3
28	17.8	18.0	18.2
32	17.7	17.9	18.2
36	17.6	17.9	18.1
40	17.6	17.8	18.0
44	17.5	17.7	17.9
48	17.4	17.6	17.8
52	17.3	17.5	17.7
56	17.2	17.4	17.5
60	17.1	17.2	17.4
64	17.0	17.1	17.3
68	16.8	17.0	17.1
72	16.7	16.8	17.0
76	16.6	16.7	16.8
80	16.5	16.6	16.7
84	16.3	16.4	16.5
88	16.2	16.3	16.3
90	16.1	16.2	16.2

Add to table, back cover

Moon's Upper Limb
Subtract

Alt.	4	5	6
°	′	′	′
0			
4	14.2	14.0	13.9
8	14.2	14.0	13.9
12	14.2	14.1	13.9
16	14.2	14.1	13.9
20	14.3	14.1	14.0
24	14.3	14.2	14.0
28	14.4	14.2	14.1
32	14.4	14.3	14.2
36	14.5	14.4	14.3
40	14.6	14.5	14.4
44	14.7	14.6	14.5
48	14.7	14.7	14.6
52	14.8	14.8	14.7
56	15.0	14.9	14.8
60	15.1	15.0	15.0
64	15.2	15.1	15.1
68	15.3	15.3	15.2
72	15.4	15.4	15.4
76	15.5	15.5	15.5
80	15.7	15.7	15.7
84	15.8	15.8	15.9
88	15.9	16.0	16.0
90	16.0	16.1	16.1

Subtract from table, back cover

GCT	♈ GHA	VENUS −4.3 GHA	Dec.	MARS 1.9 GHA	Dec.	JUPITER −2.5 GHA	Dec.	SATURN 1.1 GHA	Dec.	MOON GHA	code	Dec.	code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
0	14 50.0	219 46.0	+ 6 00.0	221 05.8	+12 16.9	6 15.6	+ 1 55.2	188 06.0	− 0 34.2	105 10.1	32	−28 19.4	+ 12
1	29 52.5	234 47.3	00.1	236 06.7	16.3	21 18.4	55.0	203 08.2	34.3	119 32.3	33	28 18.2	+ 13
2	44 55.0	249 48.7	00.1	251 07.7	15.8	36 21.2	54.9	218 10.4	34.5	133 54.6	32	28 16.9	+ 15
3	59 57.4	264 50.0	·· 00.2	266 08.7	·· 15.3	51 23.9	·· 54.8	233 12.5	·· 34.6	148 16.8	33	·28 15.4	+ 17
4	74 59.9	279 51.3	00.2	281 09.7	14.7	66 26.7	54.6	248 14.7	34.7	162 39.1	34	28 13.7	+ 19
5	90 02.4	294 52.6	00.3	296 10.7	14.2	81 29.5	54.5	263 16.9	34.8	177 01.5	33	28 11.8	+ 21
6	105 04.8	309 54.0	+ 6 00.3	311 11.7	+12 13.7	96 32.3	+ 1 54.4	278 19.1	− 0 34.9	191 23.8	34	−28 09.7	+ 24
7	120 07.3	324 55.3	00.4	326 12.7	13.1	111 35.0	54.3	293 21.3	35.1	205 46.2	34	28 07.3	+ 25
8	135 09.7	339 56.6	00.5	341 13.7	12.6	126 37.8	54.1	308 23.5	35.2	220 08.6	34	28 04.8	+ 26
9	150 12.2	354 57.9	·· 00.5	356 14.7	·· 12.0	141 40.6	·· 54.0	323 25.6	·· 35.3	234 31.0	35	·28 02.2	+ 29
10	165 14.7	9 59.2	00.6	11 15.7	11.5	156 43.3	53.9	338 27.8	35.4	248 53.5	35	27 59.3	+ 31
11	180 17.1	25 00.5	00.6	26 16.6	11.0	171 46.1	53.7	353 30.0	35.5	263 16.0	36	27 56.2	+ 33
12	195 19.6	40 01.8	+ 6 00.7	41 17.6	+12 10.4	186 48.9	+ 1 53.6	8 32.2	− 0 35.7	277 38.6	36	−27 52.9	+ 34
13	210 22.1	55 03.1	00.7	56 18.6	09.9	201 51.7	53.5	23 34.4	35.8	292 01.2	36	27 49.5	+ 37
14	225 24.5	70 04.4	00.7	71 19.6	09.4	216 54.4	53.3	38 36.5	35.9	306 23.8	37	27 45.8	+ 38
15	240 27.0	85 05.7	·· 00.8	86 20.6	·· 08.8	231 57.2	·· 53.2	53 38.7	·· 36.0	320 46.5	37	·27 42.0	+ 41
16	255 29.5	100 07.0	00.8	101 21.6	08.3	247 00.0	53.1	68 40.9	36.1	335 09.2	38	27 37.9	+ 42
17	270 31.9	115 08.3	00.9	116 22.6	07.8	262 02.8	53.0	83 43.1	36.3	349 32.0	39	27 33.7	+ 44
18	285 34.4	130 09.5	+ 6 00.9	131 23.6	+12 07.2	277 05.5	+ 1 52.8	98 45.3	− 0 36.4	3 54.9	39	−27 29.3	+ 46
19	300 36.9	145 10.8	00.9	146 24.6	06.7	292 08.3	52.7	113 47.4	36.5	18 17.8	39	27 24.7	+ 48
20	315 39.3	160 12.1	01.0	161 25.6	06.2	307 11.1	52.6	128 49.6	36.6	32 40.7	40	27 19.9	+ 49
21	330 41.8	175 13.4	·· 01.0	176 26.6	·· 05.6	322 13.8	·· 52.4	143 51.8	·· 36.7	47 03.7	41	·27 15.0	+ 52
22	345 44.2	190 14.7	01.1	191 27.6	05.1	337 16.6	52.3	158 54.0	36.9	61 26.8	42	27 09.8	+ 53
23	0 46.7	205 15.9	01.1	206 28.6	04.6	352 19.4	52.2	173 56.2	37.0	75 50.0	42	27 04.5	+ 55
0	15 49.2	220 17.2	+ 6 01.1	221 29.5	+12 04.0	7 22.1	+ 1 52.0	188 58.4	− 0 37.1	90 13.2	43	−26 59.0	+ 57
1	30 51.6	235 18.5	01.1	236 30.5	03.5	22 24.9	51.9	204 00.5	37.2	104 36.5	43	26 53.3	+ 59
2	45 54.1	250 19.7	01.2	251 31.5	02.9	37 27.7	51.8	219 02.7	37.3	118 59.8	44	26 47.4	+ 60
3	60 56.6	265 21.0	·· 01.2	266 32.5	·· 02.4	52 30.5	·· 51.7	234 04.9	·· 37.5	133 23.2	45	·26 41.4	+ 63
4	75 59.0	280 22.2	01.2	281 33.5	01.9	67 33.2	51.5	249 07.1	37.6	147 46.7	46	26 35.1	+ 64
5	91 01.5	295 23.5	01.3	296 34.5	01.3	82 36.0	51.4	264 09.3	37.7	162 10.3	47	26 28.7	+ 65
6	106 04.0	310 24.7	+ 6 01.3	311 35.5	+12 00.8	97 38.8	+ 1 51.3	279 11.4	− 0 37.8	176 34.0	47	−26 22.2	+ 68
7	121 06.4	325 26.0	01.3	326 36.5	12 00.3	112 41.5	51.1	294 13.6	37.9	190 57.7	48	26 15.4	+ 69
8	136 08.9	340 27.2	01.3	341 37.5	11 59.7	127 44.3	51.0	309 15.8	38.1	205 21.5	49	26 08.5	+ 71
9	151 11.3	355 28.5	·· 01.3	356 38.5	·· 59.2	142 47.1	·· 50.9	324 18.0	·· 38.2	219 45.4	49	·26 01.4	+ 73
10	166 13.8	10 29.7	01.4	11 39.5	58.6	157 49.9	50.8	339 20.2	38.3	234 09.3	51	25 54.1	+ 74
11	181 16.3	25 31.0	01.4	26 40.5	58.1	172 52.6	50.6	354 22.3	38.4	248 33.4	51	25 46.7	+ 76
12	196 18.7	40 32.2	+ 6 01.4	41 41.5	+11 57.6	187 55.4	+ 1 50.5	9 24.5	− 0 38.5	262 57.5	53	−25 39.1	+ 77
13	211 21.2	55 33.4	01.4	56 42.5	57.0	202 58.2	50.4	24 26.7	38.6	277 21.8	53	25 31.4	+ 80
14	226 23.7	70 34.7	01.4	71 43.5	56.5	218 00.9	50.2	39 28.9	38.8	291 46.1	54	25 23.4	+ 81
15	241 26.1	85 35.9	·· 01.4	86 44.5	·· 56.0	233 03.7	·· 50.1	54 31.1	·· 38.9	306 10.5	55	·25 15.3	+ 82
16	256 28.6	100 37.1	01.4	101 45.5	55.4	248 06.5	50.0	69 33.3	39.0	320 35.0	56	25 07.1	+ 84
17	271 31.1	115 38.3	01.5	116 46.5	54.9	263 09.2	49.9	84 35.4	39.1	334 59.6	56	24 58.7	+ 86
18	286 33.5	130 39.6	+ 6 01.5	131 47.5	+11 54.3	278 12.0	+ 1 49.7	99 37.6	− 0 39.2	349 24.2	58	−24 50.1	+ 87
19	301 36.0	145 40.8	01.5	146 48.5	53.8	293 14.8	49.6	114 39.8	39.4	3 49.0	59	24 41.4	+ 89
20	316 38.5	160 42.0	01.5	161 49.5	53.3	308 17.6	49.5	129 42.0	39.5	18 13.9	59	24 32.5	+ 90
21	331 40.9	175 43.2	·· 01.5	176 50.4	·· 52.7	323 20.3	·· 49.3	144 44.2	·· 39.6	32 38.8	61	·24 23.5	+ 92
22	346 43.4	190 44.4	01.5	191 51.4	52.2	338 23.1	49.2	159 46.3	39.7	47 03.9	61	24 14.3	+ 93
23	1 45.8	205 45.6	01.5	206 52.4	51.7	353 25.9	49.1	174 48.5	39.8	61 29.0	63	24 05.0	+ 95
0	16 48.3	220 46.8	+ 6 01.5	221 53.4	+11 51.1	8 28.6	+ 1 48.9	189 50.7	− 0 40.0	75 54.3	63	−23 55.5	+ 97
1	31 50.8	235 48.0	01.5	236 54.4	50.6	23 31.4	48.8	204 52.9	40.1	90 19.6	65	23 45.8	+ 97
2	46 53.2	250 49.3	01.5	251 55.4	50.0	38 34.2	48.7	219 55.1	40.2	104 45.1	65	23 36.1	+100
3	61 55.7	265 50.4	·· 01.5	266 56.4	·· 49.5	53 36.9	·· 48.6	234 57.2	·· 40.3	119 10.6	66	·23 26.1	+100
4	76 58.2	280 51.6	01.5	281 57.4	49.0	68 39.7	48.4	249 59.4	40.4	133 36.2	68	23 16.1	+102
5	92 00.6	295 52.8	01.5	296 58.4	48.4	83 42.5	48.3	265 01.6	40.6	148 02.0	68	23 05.9	+104
6	107 03.1	310 54.0	+ 6 01.5	311 59.4	+11 47.9	98 45.3	+ 1 48.2	280 03.8	− 0 40.7	162 27.8	70	−22 55.5	+105
7	122 05.6	325 55.2	01.5	327 00.4	47.3	113 48.0	48.1	295 06.0	40.8	176 53.8	70	22 45.0	+106
8	137 08.0	340 56.4	01.5	342 01.4	46.8	128 50.8	47.9	310 08.2	40.9	191 19.8	71	22 34.4	+107
9	152 10.5	355 57.6	·· 01.4	357 02.4	·· 46.3	143 53.6	·· 47.8	325 10.3	·· 41.0	205 45.9	73	·22 23.7	+109
10	167 13.0	10 58.8	01.4	12 03.4	45.7	158 56.3	47.7	340 12.5	41.1	220 12.2	73	22 12.8	+110
11	182 15.4	25 59.9	01.4	27 04.4	45.2	173 59.1	47.5	355 14.7	41.3	234 38.5	75	22 01.8	+112
12	197 17.9	41 01.1	+ 6 01.4	42 05.4	+11 44.6	189 01.9	+ 1 47.4	10 16.9	− 0 41.4	249 05.0	75	−21 50.6	+113
13	212 20.3	56 02.3	01.4	57 06.4	44.1	204 04.6	47.3	25 19.1	41.5	263 31.5	77	21 39.3	+114
14	227 22.8	71 03.5	01.4	72 07.4	43.6	219 07.4	47.2	40 21.2	41.6	277 58.2	77	21 27.9	+115
15	242 25.3	86 04.6	·· 01.3	87 08.4	·· 43.0	234 10.2	·· 47.0	55 23.4	·· 41.7	292 24.9	78	·21 16.4	+116
16	257 27.7	101 05.8	01.3	102 09.4	42.5	249 12.9	46.9	70 25.6	41.9	306 51.7	80	21 04.8	+118
17	272 30.2	116 07.0	01.3	117 10.4	42.0	264 15.7	46.8	85 27.8	42.0	321 18.7	80	20 53.0	+119
18	287 32.7	131 08.1	+ 6 01.3	132 11.4	+11 41.4	279 18.5	+ 1 46.6	100 30.0	− 0 42.1	335 45.7	82	−20 41.1	+120
19	302 35.1	146 09.3	01.3	147 12.4	40.9	294 21.2	46.5	115 32.2	42.2	350 12.9	82	20 29.1	+121
20	317 37.6	161 10.4	01.2	162 13.4	40.3	309 24.0	46.4	130 34.3	42.3	4 40.1	84	20 17.0	+123
21	332 40.1	176 11.6	·· 01.2	177 14.4	·· 39.8	324 26.8	·· 46.3	145 36.5	·· 42.5	19 07.5	84	·20 04.7	+123
22	347 42.5	191 12.7	01.2	192 15.4	39.3	339 29.6	46.1	160 38.7	42.6	33 34.9	86	19 52.4	+125
23	2 45.0	206 13.9	01.1	207 16.4	38.7	354 32.3	46.0	175 40.9	42.7	48 02.5	86	19 39.9	+125
24	17 47.5	221 15.0	+ 6 01.1	222 17.4	+11 38.2	9 35.1	+ 1 45.9	190 43.1	− 0 42.8	62 30.1	88	−19 27.4	+127
code	—	+ 12	0	+ 10	− 6	+ 28	− 1	+ 22	− 1				

GCT	SUN GHA	SUN Dec.
h	° ′	° ′
0	182 57.1	− 5 06.2
1	197 57.3	07.2
2	212 57.5	08.1
3	227 57.7 ··	09.1
4	242 57.9	10.1
5	257 58.1	11.0
6	272 58.2	− 5 12.0
7	287 58.4	12.9
8	302 58.6	13.9
9	317 58.8 ··	14.9
10	332 59.0	15.8
11	347 59.2	16.8
12	2 59.3	− 5 17.7
13	17 59.5	18.7
14	32 59.7	19.7
15	47 59.9 ··	20.6
16	63 00.1	21.6
17	78 00.2	22.5
18	93 00.4	− 5 23.5
19	108 00.6	24.4
20	123 00.8	25.4
21	138 01.0 ··	26.4
22	153 01.1	27.3
23	168 01.3	28.3
0	183 01.5	− 5 29.2
1	198 01.7	30.2
2	213 01.9	31.1
3	228 02.0 ··	32.1
4	243 02.2	33.1
5	258 02.4	34.0
6	273 02.6	− 5 35.0
7	288 02.8	35.9
8	303 02.9	36.9
9	318 03.1 ··	37.8
10	333 03.3	38.8
11	348 03.5	39.8
12	3 03.6	− 5 40.7
13	18 03.8	41.7
14	33 04.0	42.6
15	48 04.2 ··	43.6
16	63 04.3	44.5
17	78 04.5	45.5
18	93 04.7	− 5 46.4
19	108 04.9	47.4
20	123 05.0	48.4
21	138 05.2 ··	49.3
22	153 05.4	50.3
23	168 05.6	51.2
0	183 05.7	− 5 52.2
1	198 05.9	53.1
2	213 06.1	54.1
3	228 06.3 ··	55.0
4	243 06.4	56.0
5	258 06.6	56.9
6	273 06.8	− 5 57.9
7	288 07.0	58.9
8	303 07.1	5 59.8
9	318 07.3 ·	6 00.8
10	333 07.5	01.7
11	348 07.7	02.7
12	3 07.8	− 6 03.6
13	18 08.0	04.6
14	33 08.2	05.5
15	48 08.4 ··	06.5
16	63 08.5	07.4
17	78 08.7	08.4
18	93 08.9	− 6 09.3
19	108 09.0	10.3
20	123 09.2	11.2
21	138 09.4 ··	12.2
22	153 09.6	13.1
23	168 09.7	14.1
24	183 09.9	− 6 15.0
code	−	− 10

STARS No.	SHA	Dec.	Transit Mer. Gr.
	° ′	° ′	h m
1	358 31.3	+28 49.6	22 59
2	358 20.7	+58 53.2	23 00
3	349 42.0	−18 14.9	23 34
4	339 19.9	+59 59.2	0 19
5	336 00.3	−57 28.7	0 33
6	332 18.8	+89 02.3	0 47
7	328 52.9	+23 14.3	1 01
8	315 53.0	−40 29.5	1 53
9	309 46.6	+49 41.6	2 17
10	291 42.5	+16 25.0	3 29
11	281 56.5	− 8 15.0	4 08
12	281 42.9	+45 57.1	4 09
13	279 21.6	+ 6 18.7	4 19
14	279 11.2	+28 34.2	4 19
15	276 33.3	− 1 13.6	4 30
16	271 51.4	+ 7 24.2	4 49
17	264 16.7	−52 39.6	5 19
18	259 14.6	−16 38.5	5 39
19	255 49.0	−28 53.9	5 52
20	245 48.3	+ 5 21.2	6 32
21	244 24.4	+28 08.8	6 38
22	234 37.4	−59 20.8	7 17
23	223 27.0	−43 13.9	8 02
24	221 50.6	−69 30.7	8 08
25	218 41.9	− 8 26.7	8 21
26	208 33.0	+12 12.3	9 01
27	194 48.7	+62 00.6	9 56
28	183 21.2	+14 50.6	10 42
29	174 02.3	−62 49.9	11 19
30	172 53.6	−56 50.5	11 23
31	168 47.5	−59 25.5	11 40
32	167 01.6	+56 13.3	11 47
33	159 30.5	+55 10.6	12 17
34	159 20.5	−10 54.6	12 17
35	153 35.6	+49 33.2	12 40
36	149 02.8	−36 08.1	12 58
37	146 38.3	+19 26.0	13 08
38	140 56.1	−60 38.5	13 31
39	137 18.3	+74 21.2	13 45
40	126 50.5	+26 52.6	14 27
41	120 38.0	−22 29.3	14 52
42	113 23.5	−26 19.7	15 21
43	109 07.4	−68 56.9	15 38
44	103 05.9	−15 40.1	16 02
45	97 25.1	−37 04.5	16 24
46	96 49.6	+12 35.7	16 27
47	91 07.8	+51 29.8	16 49
48	84 45.4	−34 24.8	17 15
49	81 10.5	+38 44.4	17 29
50	76 55.8	−26 21.7	17 46
51	62 53.4	+ 8 44.4	18 42
52	54 31.9	−56 53.8	19 15
53	50 03.1	+45 06.6	19 33
54	34 32.5	+ 9 39.3	20 35
55	28 41.4	−47 11.8	20 59
56	16 14.7	−29 52.7	21 48
57	14 24.3	+14 56.9	21 55

Lat.	Sunrise	Twlt. begins	Moonrise 7	Moonrise 8	Moonrise 9	Moonrise 10
N °	h m	h m	h m	h m	h m	h m
70	6 41	3 06	■	■	■	17 48
68	6 35	3 22	■	■	18 17	17 23
66	6 31	3 33	■	■	17 33	17 03
64	6 27	3 44	■	17 35	17 03	16 48
62	6 23	3 52	17 06	16 48	16 40	16 34
60	6 20	3 59	16 03	16 17	16 22	16 23
58	6 18	4 05	15 29	15 54	16 07	16 13
56	6 15	4 09	15 03	15 35	15 54	16 05
54	6 13	4 13	14 43	15 19	15 42	15 57
52	6 11	4 18	14 26	15 06	15 32	15 50
50	6 10	4 21	14 12	14 53	15 23	15 44
45	6 06	4 27	13 42	14 28	15 03	15 30
40	6 02	4 31	13 19	14 08	14 47	15 19
35	6 00	4 35	13 00	13 51	14 34	15 09
30	5 57	4 37	12 43	13 37	14 22	15 01
20	5 52	4 39	12 15	13 12	14 02	14 46
10	5 48	4 38	11 51	12 50	13 44	14 33
0	5 44	4 36	11 29	12 30	13 28	14 21
10	5 40	4 31	11 06	12 10	13 11	14 09
20	5 36	4 23	10 42	11 48	12 53	13 55
30	5 31	4 11	10 14	11 23	12 32	13 40
35	5 28	4 02	9 58	11 08	12 20	13 32
40	5 24	3 53	9 39	10 51	12 06	13 21
45	5 20	3 39	9 15	10 30	11 50	13 10
50	5 16	3 23	8 45	10 03	11 29	12 55
52	5 13	3 14	8 30	9 51	11 19	12 48
54	5 11	3 04	8 13	9 36	11 08	12 41
56	5 08	2 53	7 52	9 18	10 55	12 32
58	5 06	2 39	7 26	8 58	10 40	12 23
60	5 02	2 22	6 49	8 31	10 23	12 11
S						

Lat.	Sunset	Twlt. ends	Moonset 7	Moonset 8	Moonset 9	Moonset 10
N °	h m	h m	h m	h m	h m	h m
70	16 53	20 23	■	■	■	23 44
68	16 59	20 09	■	■	21 23	24 07
66	17 03	19 56	■	■	22 07	24 25
64	17 07	19 47	■	20 06	22 35	24 39
62	17 11	19 40	18 27	20 52	22 57	24 51
60	17 14	19 33	19 30	21 22	23 14	25 01
58	17 17	19 28	20 04	21 44	23 29	25 09
56	17 19	19 23	20 29	22 03	23 41	25 17
54	17 21	19 19	20 49	22 18	23 52	25 24
52	17 23	19 15	21 06	22 31	24 01	0 01
50	17 25	19 12	21 20	22 43	24 10	0 10
45	17 29	19 06	21 49	23 07	24 28	0 28
40	17 32	19 02	22 12	23 26	24 42	0 42
35	17 35	18 59	22 31	23 42	24 55	0 55
30	17 38	18 57	22 47	23 56	25 05	1 05
20	17 43	18 56	23 14	24 19	0 19	1 23
10	17 47	18 57	23 37	24 39	0 39	1 39
0	17 51	19 00	23 58	24 58	0 58	1 53
10	17 55	19 05	24 20	0 20	1 16	2 08
20	18 00	19 14	24 43	0 43	1 36	2 23
30	18 05	19 26	0 11	1 09	1 59	2 41
35	18 08	19 35	0 28	1 25	2 12	2 51
40	18 12	19 46	0 48	1 43	2 27	3 02
45	18 16	19 59	1 11	2 04	2 45	3 16
50	18 21	20 17	1 42	2 32	3 07	3 32
52	18 23	20 25	1 57	2 45	3 17	3 39
54	18 26	20 36	2 14	3 00	3 29	3 48
56	18 29	20 48	2 35	3 18	3 42	3 57
58	18 32	21 03	3 02	3 39	3 58	4 08
60	18 35	21 20	3 38	4 07	4 16	4 20
S						

GCT	Equation of Time (App.—Mean) 7	8	9
h	m s	m s	m s
0	+11 48.2	+12 05.6	+12 22.7
6	+11 52.6	+12 09.9	+12 26.8
12	+11 57.0	+12 14.2	+12 31.0
18	+12 01.3	+12 18.4	+12 35.1
24	+12 05.6	+12 22.7	+12 39.3

GCT of Transit Meridian of Greenwich

DAY	Moon	Venus	Mars	Jupiter	Saturn
	h m	h m	h m	h m	h m
7	17 44	9 20	9 15	23 31	11 26
8	18 44	9 18	9 13	23 26	11 23
9	19 41	9 16	9 12	23 22	11 19
10	20 33	9 14	9 10	23 17	11 16

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb	Venus	Mars
°	′	′	′
0			
	0.3	0.3	0.1
30			
	0.3	0.3	0.1
45			
	0.3	0.2	0.0
60			
	0.3	0.1	0.0
75			
	0.3	0.0	0.0
90			

Moon's Lower Limb
Add

Alt.	7	8	9
°	′	′	′
0			
	18.5	18.3	18.2
4			
	18.5	18.3	18.2
8			
	18.4	18.3	18.2
12			
	18.4	18.3	18.2
16			
	18.4	18.2	18.1
20			
	18.3	18.2	18.1
24			
	18.2	18.1	18.0
28			
	18.2	18.1	17.9
32			
	18.1	18.0	17.9
36			
	18.0	17.9	17.8
40			
	17.9	17.8	17.7
44			
	17.8	17.7	17.6
48			
	17.7	17.6	17.5
52			
	17.5	17.4	17.4
56			
	17.4	17.3	17.2
60			
	17.3	17.2	17.1
64			
	17.1	17.0	17.0
68			
	17.0	16.9	16.8
72			
	16.8	16.8	16.7
76			
	16.7	16.6	16.6
80			
	16.5	16.5	16.4
84			
	16.3	16.3	16.3
88			
	16.2	16.2	16.2
90			

Add to table, back cover

Moon's Upper Limb
Subtract

Alt.	7	8	9
°	′	′	′
0			
	13.9	14.0	14.0
4			
	13.9	14.0	14.0
8			
	13.9	14.0	14.1
12			
	13.9	14.0	14.1
16			
	14.0	14.1	14.1
20			
	14.0	14.1	14.2
24			
	14.1	14.2	14.2
28			
	14.2	14.2	14.3
32			
	14.3	14.3	14.4
36			
	14.4	14.4	14.5
40			
	14.5	14.5	14.6
44			
	14.6	14.6	14.7
48			
	14.7	14.7	14.8
52			
	14.8	14.9	14.9
56			
	15.0	15.0	15.0
60			
	15.1	15.1	15.1
64			
	15.2	15.3	15.3
68			
	15.4	15.4	15.4
72			
	15.5	15.5	15.5
76			
	15.7	15.7	15.7
80			
	15.9	15.8	15.8
84			
	16.0	16.0	16.0
88			
	16.1	16.1	16.1
90			

Subtract from table, back cover

First Quarter 8

GCT	♈	VENUS −4.3		MARS 1.9		JUPITER −2.5		SATURN 1.1		MOON			
	GHA	GHA	Dec.	GHA	Dec.	GHA	Dec.	GHA	Dec.	GHA	code	Dec.	code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
0	17 47.5	221 15.0	+ 6 01.1	222 17.4	+11 38.2	9 35.1	+ 1 45.9	190 43.1	− 0 42.8	62 30.1	88	−19 27.4	+127
1	32 49.9	236 16.2	01.1	237 18.4	37.6	24 37.9	45.7	205 45.2	42.9	76 57.9	88	19 14.7	+128
2	47 52.4	251 17.3	01.1	252 19.4	37.1	39 40.6	45.6	220 47.4	43.1	91 25.7	89	19 01.9	+129
3	62 54.8	266 18.5	01.0	267 20.4	36.5	54 43.4	45.5	235 49.6	43.2	105 53.6	91	18 49.0	+130
4	77 57.3	281 19.6	01.0	282 21.4	36.0	69 46.2	45.4	250 51.8	43.3	120 21.7	91	18 36.0	+131
5	92 59.8	296 20.7	00.9	297 22.4	35.5	84 48.9	45.2	265 54.0	43.4	134 49.8	92	18 22.9	+131
6	108 02.2	311 21.9	+ 6 00.9	312 23.4	+11 34.9	99 51.7	+ 1 45.1	280 56.2	− 0 43.5	149 18.0	93	−18 09.8	+133
7	123 04.7	326 23.0	00.9	327 24.4	34.4	114 54.5	45.0	295 58.3	43.6	163 46.3	95	17 56.5	+134
8	138 07.2	341 24.1	00.8	342 25.4	33.8	129 57.2	44.9	311 00.5	43.8	178 14.8	95	17 43.1	+135
9	153 09.6	356 25.2	00.8	357 26.4	33.3	145 00.0	44.7	326 02.7	43.9	192 43.3	96	17 29.6	+135
10	168 12.1	11 26.4	00.7	12 27.4	32.8	160 02.8	44.6	341 04.9	44.0	207 11.9	97	17 16.1	+137
11	183 14.6	26 27.5	00.7	27 28.4	32.2	175 05.5	44.5	356 07.1	44.1	221 40.6	98	17 02.4	+137
12	198 17.0	41 28.6	+ 6 00.7	42 29.5	+11 31.7	190 08.3	+ 1 44.3	11 09.2	− 0 44.2	236 09.4	98	−16 48.7	+139
13	213 19.5	56 29.7	00.6	57 30.5	31.1	205 11.1	44.2	26 11.4	44.4	250 38.2	100	16 34.8	+139
14	228 21.9	71 30.8	00.6	72 31.5	30.6	220 13.8	44.1	41 13.6	44.5	265 07.2	101	16 20.9	+140
15	243 24.4	86 31.9	00.5	87 32.5	30.1	235 16.6	44.0	56 15.8	44.6	279 36.3	101	16 06.9	+141
16	258 26.9	101 33.0	00.5	102 33.5	29.5	250 19.4	43.8	71 18.0	44.7	294 05.4	103	15 52.8	+141
17	273 29.3	116 34.2	00.4	117 34.5	29.0	265 22.1	43.7	86 20.2	44.8	308 34.7	103	15 38.7	+143
18	288 31.8	131 35.3	+ 6 00.4	132 35.5	+11 28.4	280 24.9	+ 1 43.6	101 22.3	− 0 44.9	323 04.0	104	−15 24.4	+143
19	303 34.3	146 36.4	00.3	147 36.5	27.9	295 27.7	43.5	116 24.5	45.1	337 33.4	105	15 10.1	+144
20	318 36.7	161 37.5	00.2	162 37.5	27.3	310 30.4	43.3	131 26.7	45.2	352 02.9	106	14 55.7	+145
21	333 39.2	176 38.6	00.2	177 38.5	26.8	325 33.2	43.2	146 28.9	45.3	6 32.5	106	14 41.2	+145
22	348 41.7	191 39.6	00.1	192 39.5	26.3	340 36.0	43.1	161 31.1	45.4	21 02.1	108	14 26.7	+146
23	3 44.1	206 40.7	00.1	207 40.5	25.7	355 38.7	42.9	176 33.2	45.5	35 31.9	108	14 12.1	+147
0	18 46.6	221 41.8	+ 6 00.0	222 41.5	+11 25.2	10 41.5	+ 1 42.8	191 35.4	− 0 45.7	50 01.7	109	−13 57.4	+147
1	33 49.1	236 42.9	5 59.9	237 42.5	24.6	25 44.3	42.7	206 37.6	45.8	64 31.6	110	13 42.7	+148
2	48 51.5	251 44.0	59.9	252 43.5	24.1	40 47.0	42.6	221 39.8	45.9	79 01.6	110	13 27.9	+149
3	63 54.0	266 45.1	59.8	267 44.5	23.5	55 49.8	42.4	236 42.0	46.0	93 31.6	112	13 13.0	+150
4	78 56.4	281 46.2	59.8	282 45.5	23.0	70 52.6	42.3	251 44.2	46.1	108 01.8	112	12 58.0	+150
5	93 58.9	296 47.2	59.7	297 46.5	22.5	85 55.3	42.2	266 46.3	46.2	122 32.0	113	12 43.0	+150
6	109 01.4	311 48.3	+ 5 59.6	312 47.5	+11 21.9	100 58.1	+ 1 42.1	281 48.5	− 0 46.4	137 02.3	114	−12 28.0	+151
7	124 03.8	326 49.4	59.5	327 48.5	21.4	116 00.9	41.9	296 50.7	46.5	151 32.7	114	12 12.9	+152
8	139 06.3	341 50.4	59.5	342 49.5	20.8	131 03.6	41.8	311 52.9	46.6	166 03.1	115	11 57.7	+152
9	154 08.8	356 51.5	59.4	357 50.6	20.3	146 06.4	41.7	326 55.1	46.7	180 33.6	116	11 42.5	+153
10	169 11.2	11 52.6	59.3	12 51.6	19.7	161 09.2	41.6	341 57.3	46.8	195 04.2	116	11 27.2	+153
11	184 13.7	26 53.6	59.3	27 52.6	19.2	176 11.9	41.4	356 59.4	47.0	209 34.8	118	11 11.9	+154
12	199 16.2	41 54.7	+ 5 59.2	42 53.6	+11 18.7	191 14.7	+ 1 41.3	12 01.6	− 0 47.1	224 05.6	117	−10 56.5	+154
13	214 18.6	56 55.8	59.1	57 54.6	18.1	206 17.5	41.2	27 03.8	47.2	238 36.3	119	10 41.1	+155
14	229 21.1	71 56.8	59.0	72 55.6	17.6	221 20.2	41.1	42 06.0	47.3	253 07.2	119	10 25.6	+155
15	244 23.6	86 57.9	58.9	87 56.6	17.0	236 23.0	40.9	57 08.2	47.4	267 38.1	120	10 10.1	+156
16	259 26.0	101 58.9	58.9	102 57.6	16.5	251 25.8	40.8	72 10.3	47.5	282 09.1	120	9 54.5	+156
17	274 28.5	117 00.0	58.8	117 58.6	15.9	266 28.5	40.7	87 12.5	47.7	296 40.1	122	9 38.9	+156
18	289 30.9	132 01.0	+ 5 58.7	132 59.6	+11 15.4	281 31.3	+ 1 40.6	102 14.7	− 0 47.8	311 11.3	121	− 9 23.3	+157
19	304 33.4	147 02.1	58.6	148 00.6	14.9	296 34.1	40.4	117 16.9	47.9	325 42.4	123	9 07.6	+157
20	319 35.9	162 03.1	58.5	163 01.6	14.3	311 36.8	40.3	132 19.1	48.0	340 13.7	122	8 51.9	+158
21	334 38.3	177 04.1	58.4	178 02.6	13.8	326 39.6	40.2	147 21.3	48.1	354 44.9	124	8 36.1	+158
22	349 40.8	192 05.2	58.3	193 03.6	13.2	341 42.3	40.0	162 23.4	48.3	9 16.3	124	8 20.3	+158
23	4 43.3	207 06.2	58.3	208 04.7	12.7	356 45.1	39.9	177 25.6	48.4	23 47.7	124	8 04.5	+159
0	19 45.7	222 07.3	+ 5 58.2	223 05.7	+11 12.1	11 47.9	+ 1 39.8	192 27.8	− 0 48.5	38 19.1	125	− 7 48.6	+159
1	34 48.2	237 08.3	58.1	238 06.7	11.6	26 50.6	39.7	207 30.0	48.6	52 50.6	126	7 32.7	+159
2	49 50.7	252 09.3	58.0	253 07.7	11.0	41 53.4	39.5	222 32.2	48.7	67 22.2	126	7 16.8	+159
3	64 53.1	267 10.3	57.9	268 08.7	10.5	56 56.2	39.4	237 34.4	48.8	81 53.8	127	7 00.9	+160
4	79 55.6	282 11.4	57.8	283 09.7	10.0	71 58.9	39.3	252 36.5	49.0	96 25.5	127	6 44.9	+160
5	94 58.0	297 12.4	57.7	298 10.7	09.4	87 01.7	39.2	267 38.7	49.1	110 57.2	127	6 28.9	+160
6	110 00.5	312 13.4	+ 5 57.6	313 11.7	+11 08.9	102 04.5	+ 1 39.0	282 40.9	− 0 49.2	125 28.9	128	− 6 12.9	+160
7	125 03.0	327 14.4	57.5	328 12.7	08.3	117 07.2	38.9	297 43.1	49.3	140 00.7	129	5 56.9	+161
8	140 05.4	342 15.4	57.4	343 13.7	07.8	132 10.0	38.8	312 45.3	49.4	154 32.6	129	5 40.8	+161
9	155 07.9	357 16.5	57.3	358 14.7	07.2	147 12.8	38.7	327 47.5	49.6	169 04.5	129	5 24.7	+161
10	170 10.4	12 17.5	57.2	13 15.8	06.7	162 15.5	38.5	342 49.6	49.7	183 36.4	130	5 08.6	+161
11	185 12.8	27 18.5	57.1	28 16.8	06.1	177 18.3	38.4	357 51.8	49.8	198 08.4	130	4 52.5	+161
12	200 15.3	42 19.5	+ 5 57.0	43 17.8	+11 05.6	192 21.0	+ 1 38.3	12 54.0	− 0 49.9	212 40.4	131	− 4 36.4	+161
13	215 17.8	57 20.5	56.9	58 18.8	05.1	207 23.8	38.2	27 56.2	50.0	227 12.5	131	4 20.3	+162
14	230 20.2	72 21.5	56.8	73 19.8	04.5	222 26.6	38.0	42 58.4	50.1	241 44.6	131	4 04.1	+161
15	245 22.7	87 22.5	56.6	88 20.8	04.0	237 29.3	37.9	58 00.5	50.3	256 16.7	131	3 48.0	+162
16	260 25.2	102 23.5	56.5	103 21.8	03.4	252 32.1	37.8	73 02.7	50.4	270 48.8	132	3 31.8	+162
17	275 27.6	117 24.5	56.4	118 22.8	02.9	267 34.9	37.7	88 04.9	50.5	285 21.0	133	3 15.6	+161
18	290 30.1	132 25.5	+ 5 56.3	133 23.8	+11 02.3	282 37.6	+ 1 37.5	103 07.1	− 0 50.6	299 53.3	132	− 2 59.5	+162
19	305 32.5	147 26.5	56.2	148 24.9	01.8	297 40.4	37.4	118 09.3	50.7	314 25.5	133	2 43.3	+162
20	320 35.0	162 27.5	56.1	163 25.9	01.2	312 43.1	37.3	133 11.5	50.9	328 57.8	134	2 27.1	+162
21	335 37.5	177 28.4	56.0	178 26.9	00.7	327 45.9	37.2	148 13.6	51.0	343 30.2	133	2 10.9	+162
22	350 39.9	192 29.4	55.8	193 27.9	11 00.1	342 48.7	37.1	163 15.8	51.1	358 02.5	134	1 54.7	+162
23	5 42.4	207 30.4	55.7	208 28.9	10 59.6	357 51.4	36.9	178 18.0	51.2	12 34.9	134	1 38.5	+161
24	20 44.9	222 31.4	+ 5 55.6	223 29.9	+10 59.0	12 54.2	+ 1 36.8	193 20.2	− 0 51.3	27 07.3	134	− 1 22.4	+162
code	—	+ 11	− 1	+ 10	− 6	+ 28	− 1	+ 22	− 1				

GCT	SUN GHA	SUN Dec.
h	° ′	° ′
0	183 09.9	− 6 15.0
1	198 10.1	16.0
2	213 10.2	16.9
3	228 10.4 ••	17.9
4	243 10.6	18.8
5	258 10.7	19.8
6	273 10.9	− 6 20.7
7	288 11.1	21.7
8	303 11.3	22.6
9	318 11.4 ••	23.6
10	333 11.6	24.5
11	348 11.8	25.5
12	3 11.9	− 6 26.4
13	18 12.1	27.4
14	33 12.3	28.3
15	48 12.4 ••	29.3
16	63 12.6	30.2
17	78 12.8	31.2
18	93 12.9	− 6 32.1
19	108 13.1	33.1
20	123 13.3	34.0
21	138 13.4 ••	35.0
22	153 13.6	35.9
23	168 13.8	36.9
0	183 13.9	− 6 37.8
1	198 14.1	38.8
2	213 14.3	39.7
3	228 14.4 ••	40.7
4	243 14.6	41.6
5	258 14.8	42.6
6	273 14.9	− 6 43.5
7	288 15.1	44.4
8	303 15.3	45.4
9	318 15.4 ••	46.3
10	333 15.6	47.3
11	348 15.8	48.2
12	3 15.9	− 6 49.2
13	18 16.1	50.1
14	33 16.2	51.1
15	48 16.4 ••	52.0
16	63 16.6	53.0
17	78 16.7	53.9
18	93 16.9	− 6 54.8
19	108 17.1	55.8
20	123 17.2	56.7
21	138 17.4 ••	57.7
22	153 17.5	58.6
23	168 17.7	6 59.6
0	183 17.9	− 7 00.5
1	198 18.0	01.5
2	213 18.2	02.4
3	228 18.3 ••	03.3
4	243 18.5	04.3
5	258 18.7	05.2
6	273 18.8	− 7 06.2
7	288 19.0	07.1
8	303 19.1	08.1
9	318 19.3 ••	09.0
10	333 19.5	09.9
11	348 19.6	10.9
12	3 19.8	− 7 11.8
13	18 19.9	12.8
14	33 20.1	13.7
15	48 20.3 ••	14.6
16	63 20.4	15.6
17	78 20.6	16.5
18	93 20.7	− 7 17.5
19	108 20.9	18.4
20	123 21.0	19.3
21	138 21.2 ••	20.3
22	153 21.4	21.2
23	168 21.5	22.2
24	183 21.7	− 7 23.1
code	—	− 9

STARS No.	SHA	Dec.	Transit Mer. Gr.
	° ′	° ′	h m
1	358 31.3	+28 49.7	22 47
2	358 20.7	+58 53.2	22 48
3	349 42.0	−18 14.9	23 22
4	339 19.9	+59 59.3	0 08
5	336 00.3	−57 28.7	0 21
6	332 18.4	+89 02.3	0 36
7	328 52.9	+23 14.3	0 49
8	315 53.0	−40 29.5	1 41
9	309 46.6	+49 41.6	2 05
10	291 42.5	+16 25.0	3 18
11	281 56.5	− 8 15.0	3 56
12	281 42.8	+45 57.1	3 57
13	279 21.6	+ 6 18.7	4 07
14	279 11.1	+28 34.3	4 07
15	276 33.3	− 1 13.6	4 18
16	271 51.4	+ 7 24.2	4 37
17	264 16.7	−52 39.6	5 07
18	259 14.5	−16 38.5	5 27
19	255 49.0	−28 53.9	5 41
20	245 48.3	+ 5 21.2	6 21
21	244 24.4	+28 08.7	6 26
22	234 37.4	−59 20.8	7 05
23	223 26.9	−43 13.9	7 50
24	221 50.5	−69 30.7	7 56
25	218 41.9	− 8 26.7	8 09
26	208 33.0	+12 12.3	8 49
27	194 48.7	+62 00.6	9 44
28	183 21.2	+14 50.6	10 30
29	174 02.3	−62 49.9	11 07
30	172 53.5	−56 50.5	11 11
31	168 47.5	−59 25.5	11 28
32	167 01.6	+56 13.3	11 35
33	159 30.5	+55 10.6	12 05
34	159 20.5	−10 54.6	12 06
35	153 35.6	+49 33.2	12 28
36	149 02.8	−36 08.1	12 47
37	146 38.3	+19 26.0	12 56
38	140 56.1	−60 38.5	13 19
39	137 18.4	+74 21.2	13 33
40	126 50.5	+26 52.6	14 15
41	120 38.0	−22 29.3	14 40
42	113 23.5	−26 19.7	15 09
43	109 07.4	−68 56.9	15 26
44	103 05.9	−15 40.1	15 50
45	97 25.1	−37 04.5	16 13
46	96 49.6	+12 35.7	16 15
47	91 07.9	+51 29.8	16 38
48	84 45.4	−34 24.8	17 03
49	81 10.5	+38 44.4	17 17
50	76 55.8	−26 21.7	17 34
51	62 53.4	+ 8 44.4	18 30
52	54 31.9	−56 53.8	19 04
53	50 03.1	+45 06.6	19 22
54	34 32.5	+ 9 39.3	20 23
55	28 41.4	−47 11.8	20 47
56	16 14.7	−29 52.7	21 36
57	14 24.3	+14 56.9	21 44

Lat.	Sunrise	Twlt. begins	Moonrise 10	Moonrise 11	Moonrise 12	Moonrise 13
N °	h m	h m	h m	h m	h m	h m
70	6 53	3 21	17 48	17 06	16 37	16 10
68	6 46	3 33	17 23	16 54	16 33	16 13
66	6 40	3 44	17 03	16 45	16 30	16 16
64	6 35	3 54	16 48	16 36	16 27	16 18
62	6 31	4 01	16 34	16 29	16 25	16 20
60	6 28	4 06	16 23	16 23	16 22	16 22
58	6 24	4 11	16 13	16 18	16 21	16 23
56	6 21	4 15	16 05	16 13	16 19	16 24
54	6 19	4 19	15 57	16 08	16 17	16 26
52	6 16	4 23	15 50	16 04	16 16	16 27
50	6 14	4 26	15 44	16 00	16 15	16 28
45	6 09	4 31	15 30	15 52	16 12	16 30
40	6 05	4 34	15 19	15 46	16 10	16 32
35	6 02	4 37	15 09	15 40	16 08	16 34
30	5 59	4 39	15 01	15 35	16 06	16 35
20	5 53	4 40	14 46	15 26	16 03	16 38
10	5 48	4 38	14 33	15 18	16 00	16 40
0	5 44	4 35	14 21	15 10	15 57	16 43
10	5 39	4 28	14 09	15 03	15 55	16 45
20	5 34	4 20	13 55	14 55	15 52	16 47
30	5 27	4 07	13 40	14 46	15 49	16 50
35	5 24	3 58	13 32	14 40	15 47	16 52
40	5 20	3 47	13 21	14 34	15 45	16 54
45	5 15	3 33	13 10	14 27	15 43	16 56
50	5 09	3 14	12 55	14 19	15 40	16 59
52	5 07	3 05	12 48	14 15	15 38	17 00
54	5 04	2 54	12 41	14 11	15 37	17 01
56	5 00	2 41	12 32	14 06	15 36	17 03
58	4 57	2 27	12 23	14 00	15 34	17 04
60	4 53	2 07	12 11	13 54	15 32	17 06
S						

Lat.	Sunset	Twlt. ends	Moonset 10	Moonset 11	Moonset 12	Moonset 13
N °	h m	h m	h m	h m	h m	h m
70	16 39	20 07	23 44	26 07	2 07	4 15
68	16 46	19 54	24 07	0 07	2 17	4 16
66	16 52	19 44	24 25	0 25	2 24	4 16
64	16 57	19 36	24 39	0 39	2 31	4 16
62	17 01	19 29	24 51	0 51	2 36	4 17
60	17 05	19 24	25 01	1 01	2 41	4 17
58	17 08	19 19	25 09	1 09	2 45	4 17
56	17 11	19 15	25 17	1 17	2 49	4 17
54	17 14	19 12	25 24	1 24	2 52	4 17
52	17 17	19 09	0 01	1 30	2 55	4 17
50	17 19	19 06	0 10	1 35	2 58	4 18
45	17 24	19 01	0 28	1 47	3 04	4 18
40	17 28	18 58	0 42	1 57	3 08	4 18
35	17 31	18 55	0 55	2 05	3 13	4 18
30	17 35	18 54	1 05	2 12	3 16	4 18
20	17 40	18 53	1 23	2 24	3 22	4 19
10	17 45	18 55	1 39	2 35	3 28	4 19
0	17 50	18 59	1 53	2 45	3 33	4 19
10	17 55	19 06	2 08	2 55	3 38	4 19
20	18 01	19 16	2 23	3 05	3 43	4 19
30	18 07	19 29	2 41	3 17	3 49	4 19
35	18 11	19 38	2 51	3 24	3 52	4 19
40	18 15	19 50	3 02	3 31	3 56	4 20
45	18 20	20 04	3 16	3 40	4 01	4 20
50	18 26	20 24	3 32	3 51	4 06	4 20
52	18 28	20 33	3 39	3 55	4 08	4 20
54	18 31	20 44	3 48	4 01	4 11	4 20
56	18 35	20 58	3 57	4 07	4 14	4 20
58	18 38	21 13	4 08	4 13	4 17	4 20
60	18 43	21 34	4 20	4 21	4 20	4 20
S						

GCT	Equation of Time (App.—Mean) 10	11	12
h	m s	m s	m s
0	+12 39.3	+12 55.4	+13 11.1
6	+12 43.3	+12 59.4	+13 15.0
12	+12 47.4	+13 03.3	+13 18.8
18	+12 51.4	+13 07.3	+13 22.6
24	+12 55.4	+13 11.1	+13 26.4

GCT of Transit Meridian of Greenwich

DAY	Moon	Venus	Mars	Jupiter	Saturn
	h m	h m	h m	h m	h m
10	20 33	9 14	9 10	23 17	11 16
11	21 22	9 13	9 09	23 13	11 12
12	22 08	9 11	9 07	23 09	11 09
13	22 53	9 09	9 05	23 04	11 05

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb	Venus	Mars
°	′	′	′
0			
	0.4	0.3	0.1
30			
	0.4	0.3	0.1
45			
	0.4	0.2	0.0
60			
	0.4	0.1	0.0
75			
	0.4	0.0	0.0
90			

Moon's Lower Limb
Add

Alt.	10	11	12
°	′	′	′
0			
	18.0	17.6	17.1
4			
	18.0	17.6	17.1
8			
	17.9	17.6	17.1
12			
	17.9	17.5	17.0
16			
	17.9	17.5	17.0
20			
	17.8	17.5	17.0
24			
	17.8	17.4	17.0
28			
	17.7	17.4	16.9
32			
	17.6	17.3	16.9
36			
	17.6	17.2	16.8
40			
	17.5	17.2	16.8
44			
	17.4	17.1	16.7
48			
	17.3	17.0	16.6
52			
	17.2	16.9	16.6
56			
	17.1	16.8	16.5
60			
	17.0	16.7	16.4
64			
	16.8	16.6	16.4
68			
	16.7	16.5	16.3
72			
	16.6	16.4	16.2
76			
	16.5	16.3	16.1
80			
	16.3	16.2	16.0
84			
	16.2	16.1	16.0
88			
	16.1	16.0	15.9
90			

Add to table, back cover

Moon's Upper Limb
Subtract

Alt.	10	11	12
°	′	′	′
0			
	14.2	14.4	14.7
4			
	14.2	14.4	14.7
8			
	14.2	14.4	14.7
12			
	14.2	14.4	14.7
16			
	14.3	14.5	14.7
20			
	14.3	14.5	14.8
24			
	14.4	14.5	14.8
28			
	14.4	14.6	14.8
32			
	14.5	14.7	14.9
36			
	14.6	14.7	14.9
40			
	14.7	14.8	15.0
44			
	14.7	14.9	15.0
48			
	14.8	15.0	15.1
52			
	15.0	15.0	15.2
56			
	15.1	15.1	15.2
60			
	15.2	15.2	15.3
64			
	15.3	15.3	15.4
68			
	15.4	15.4	15.5
72			
	15.5	15.5	15.5
76			
	15.7	15.7	15.6
80			
	15.8	15.8	15.7
84			
	15.9	15.9	15.8
88			
	16.0	16.0	15.9
90			

Subtract from table, back cover

Day of Atonement (Yom Kippur) 10
Columbus Day 12

833100°—50——13

GCT	♈	VENUS −4.3		MARS 1.9		JUPITER −2.5		SATURN 1.1		MOON			
	GHA	GHA	Dec.	GHA	Dec.	GHA	Dec.	GHA	Dec.	GHA	code	Dec.	code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
0	20 44.9	222 31.4	+ 5 55.6	223 29.9	+10 59.0	12 54.2	+ 1 36.8	193 20.2	− 0 51.3	27 07.3	134	− 1 22.4	+162
1	35 47.3	237 32.4	55.5	238 30.9	58.5	27 57.0	36.7	208 22.4	51.4	41 39.7	135	1 06.2	+162
2	50 49.8	252 33.3	55.4	253 31.9	58.0	42 59.7	36.6	223 24.6	51.6	56 12.2	134	0 50.0	+162
3	65 52.3	267 34.3	·· 55.2	268 33.0	·· 57.4	58 02.5	·· 36.4	238 26.7	·· 51.7	70 44.6	135	· 0 33.8	+161
4	80 54.7	282 35.3	55.1	283 34.0	56.9	73 05.2	36.3	253 28.9	51.8	85 17.1	136	0 17.7	+162
5	95 57.2	297 36.3	55.0	298 35.0	56.3	88 08.0	36.2	268 31.1	51.9	99 49.7	135	− 0 01.5	+161
6	110 59.6	312 37.2	+ 5 54.8	313 36.0	+10 55.8	103 10.8	+ 1 36.1	283 33.3	− 0 52.0	114 22.2	135	+ 0 14.6	+162
7	126 02.1	327 38.2	54.7	328 37.0	55.2	118 13.5	35.9	298 35.5	52.1	128 54.7	136	0 30.8	+161
8	141 04.6	342 39.2	54.6	343 38.0	54.7	133 16.3	35.8	313 37.7	52.3	143 27.3	136	0 46.9	+161
9	156 07.0	357 40.1	·· 54.4	358 39.0	·· 54.1	148 19.1	·· 35.7	328 39.8	·· 52.4	157 59.9	136	· 1 03.0	+161
10	171 09.5	12 41.1	54.3	13 40.0	53.6	163 21.8	35.6	343 42.0	52.5	172 32.5	136	1 19.1	+160
11	186 12.0	27 42.0	54.2	28 41.1	53.0	178 24.6	35.4	358 44.2	52.6	187 05.1	136	1 35.1	+161
12	201 14.4	42 43.0	+ 5 54.0	43 42.1	+10 52.5	193 27.3	+ 1 35.3	13 46.4	− 0 52.7	201 37.7	137	+ 1 51.2	+160
13	216 16.9	57 43.9	53.9	58 43.1	51.9	208 30.1	35.2	28 48.6	52.8	216 10.4	136	2 07.2	+160
14	231 19.4	72 44.9	53.8	73 44.1	51.4	223 32.9	35.1	43 50.8	53.0	230 43.0	137	2 23.2	+160
15	246 21.8	87 45.8	·· 53.6	88 45.1	·· 50.8	238 35.6	·· 34.9	58 52.9	·· 53.1	245 15.7	136	· 2 39.2	+160
16	261 24.3	102 46.8	53.5	103 46.1	50.3	253 38.4	34.8	73 55.1	53.2	259 48.3	137	2 55.2	+159
17	276 26.8	117 47.7	53.3	118 47.1	49.8	268 41.1	34.7	88 57.3	53.3	274 21.0	137	3 11.1	+160
18	291 29.2	132 48.7	+ 5 53.2	133 48.2	+10 49.2	283 43.9	+ 1 34.6	103 59.5	− 0 53.4	288 53.7	136	+ 3 27.1	+159
19	306 31.7	147 49.6	53.1	148 49.2	48.7	298 46.7	34.5	119 01.7	53.6	303 26.3	137	3 43.0	+158
20	321 34.1	162 50.6	52.9	163 50.2	48.1	313 49.4	34.3	134 03.9	53.7	317 59.0	137	3 58.8	+159
21	336 36.6	177 51.5	·· 52.8	178 51.2	·· 47.6	328 52.2	·· 34.2	149 06.0	·· 53.8	332 31.7	137	· 4 14.7	+158
22	351 39.1	192 52.4	52.6	193 52.2	47.0	343 54.9	34.1	164 08.2	53.9	347 04.4	136	4 30.5	+157
23	6 41.5	207 53.4	52.5	208 53.2	46.5	358 57.7	34.0	179 10.4	54.0	1 37.0	137	4 46.2	+158
0	21 44.0	222 54.3	+ 5 52.3	223 54.3	+10 45.9	14 00.5	+ 1 33.8	194 12.6	− 0 54.1	16 09.7	137	+ 5 02.0	+157
1	36 46.5	237 55.2	52.2	238 55.3	45.4	29 03.2	33.7	209 14.8	54.3	30 42.4	137	5 17.7	+156
2	51 48.9	252 56.1	52.0	253 56.3	44.8	44 06.0	33.6	224 17.0	54.4	45 15.1	136	5 33.3	+157
3	66 51.4	267 57.1	·· 51.9	268 57.3	·· 44.3	59 08.7	·· 33.5	239 19.1	·· 54.5	59 47.7	137	· 5 49.0	+156
4	81 53.9	282 58.0	51.7	283 58.3	43.7	74 11.5	33.3	254 21.3	54.6	74 20.4	137	6 04.6	+155
5	96 56.3	297 58.9	51.5	298 59.3	43.2	89 14.3	33.2	269 23.5	54.7	88 53.1	136	6 20.1	+155
6	111 58.8	312 59.8	+ 5 51.4	314 00.4	+10 42.6	104 17.0	+ 1 33.1	284 25.7	− 0 54.8	103 25.7	137	+ 6 35.6	+155
7	127 01.3	328 00.7	51.2	329 01.4	42.1	119 19.8	33.0	299 27.9	55.0	117 58.4	136	6 51.1	+154
8	142 03.7	343 01.6	51.1	344 02.4	41.5	134 22.5	32.9	314 30.1	55.1	132 31.0	136	7 06.5	+154
9	157 06.2	358 02.5	·· 50.9	359 03.4	·· 41.0	149 25.3	·· 32.7	329 32.3	·· 55.2	147 03.6	136	· 7 21.9	+154
10	172 08.6	13 03.5	50.7	14 04.4	40.4	164 28.1	32.6	344 34.4	55.3	161 36.2	136	7 37.3	+153
11	187 11.1	28 04.4	50.6	29 05.4	39.9	179 30.8	32.5	359 36.6	55.4	176 08.8	136	7 52.6	+152
12	202 13.6	43 05.3	+ 5 50.4	44 06.5	+10 39.3	194 33.6	+ 1 32.4	14 38.8	− 0 55.5	190 41.4	136	+ 8 07.8	+152
13	217 16.0	58 06.2	50.2	59 07.5	38.8	209 36.3	32.2	29 41.0	55.7	205 14.0	135	8 23.0	+152
14	232 18.5	73 07.1	50.1	74 08.5	38.2	224 39.1	32.1	44 43.2	55.8	219 46.5	135	8 38.2	+151
15	247 21.0	88 08.0	·· 49.9	89 09.5	·· 37.7	239 41.9	·· 32.0	59 45.4	·· 55.9	234 19.0	136	· 8 53.3	+150
16	262 23.4	103 08.9	49.7	104 10.5	37.1	254 44.6	31.9	74 47.5	56.0	248 51.6	135	9 08.3	+150
17	277 25.9	118 09.8	49.6	119 11.5	36.6	269 47.4	31.8	89 49.7	56.1	263 24.1	135	9 23.3	+149
18	292 28.4	133 10.7	+ 5 49.4	134 12.6	+10 36.0	284 50.1	+ 1 31.6	104 51.9	− 0 56.2	277 56.6	134	+ 9 38.2	+149
19	307 30.8	148 11.5	49.2	149 13.6	35.5	299 52.9	31.5	119 54.1	56.4	292 29.0	135	9 53.1	+148
20	322 33.3	163 12.4	49.0	164 14.6	34.9	314 55.6	31.4	134 56.3	56.5	307 01.5	134	10 07.9	+148
21	337 35.7	178 13.3	·· 48.9	179 15.6	·· 34.4	329 58.4	·· 31.3	149 58.5	·· 56.6	321 33.9	134	·10 22.7	+147
22	352 38.2	193 14.2	48.7	194 16.6	33.8	345 01.2	31.1	165 00.6	56.7	336 06.3	133	10 37.4	+147
23	7 40.7	208 15.1	48.5	209 17.7	33.3	0 03.9	31.0	180 02.8	56.8	350 38.6	134	10 52.1	+146
0	22 43.1	223 16.0	+ 5 48.3	224 18.7	+10 32.7	15 06.7	+ 1 30.9	195 05.0	− 0 56.9	5 11.0	133	+11 06.7	+145
1	37 45.6	238 16.8	48.1	239 19.7	32.2	30 09.4	30.8	210 07.2	57.1	19 43.3	133	11 21.2	+144
2	52 48.1	253 17.7	48.0	254 20.7	31.6	45 12.2	30.7	225 09.4	57.2	34 15.6	133	11 35.6	+144
3	67 50.5	268 18.6	·· 47.8	269 21.7	·· 31.1	60 14.9	·· 30.5	240 11.6	·· 57.3	48 47.9	132	·11 50.0	+144
4	82 53.0	283 19.5	47.6	284 22.8	30.5	75 17.7	30.4	255 13.8	57.4	63 20.1	133	12 04.4	+142
5	97 55.5	298 20.3	47.4	299 23.8	30.0	90 20.5	30.3	270 15.9	57.5	77 52.4	131	12 18.6	+142
6	112 57.9	313 21.2	+ 5 47.2	314 24.8	+10 29.4	105 23.2	+ 1 30.2	285 18.1	− 0 57.6	92 24.5	132	+12 32.8	+142
7	128 00.4	328 22.1	47.0	329 25.8	28.9	120 26.0	30.0	300 20.3	57.8	106 56.7	131	12 47.0	+140
8	143 02.9	343 22.9	46.8	344 26.8	28.3	135 28.7	29.9	315 22.5	57.9	121 28.8	131	13 01.0	+140
9	158 05.3	358 23.8	·· 46.6	359 27.9	·· 27.8	150 31.5	·· 29.8	330 24.7	·· 58.0	136 00.9	131	·13 15.0	+139
10	173 07.8	13 24.7	46.5	14 28.9	27.2	165 34.2	29.7	345 26.9	58.1	150 33.0	130	13 28.9	+139
11	188 10.2	28 25.5	46.3	29 29.9	26.7	180 37.0	29.6	0 29.0	58.2	165 05.0	130	13 42.8	+137
12	203 12.7	43 26.4	+ 5 46.1	44 30.9	+10 26.1	195 39.8	+ 1 29.4	15 31.2	− 0 58.3	179 37.0	130	+13 56.5	+137
13	218 15.2	58 27.2	45.9	59 31.9	25.6	210 42.5	29.3	30 33.4	58.5	194 09.0	129	14 10.2	+136
14	233 17.6	73 28.1	45.7	74 33.0	25.0	225 45.3	29.2	45 35.6	58.6	208 40.9	129	14 23.8	+136
15	248 20.1	88 28.9	·· 45.5	89 34.0	·· 24.5	240 48.0	·· 29.1	60 37.8	·· 58.7	223 12.8	129	·14 37.4	+134
16	263 22.6	103 29.8	45.3	104 35.0	23.9	255 50.8	29.0	75 40.0	58.8	237 44.7	128	14 50.8	+134
17	278 25.0	118 30.6	45.1	119 36.0	23.4	270 53.5	28.8	90 42.1	58.9	252 16.5	128	15 04.2	+133
18	293 27.5	133 31.5	+ 5 44.9	134 37.1	+10 22.8	285 56.3	+ 1 28.7	105 44.3	− 0 59.0	266 48.3	127	+15 17.5	+132
19	308 30.0	148 32.3	44.7	149 38.1	22.3	300 59.0	28.6	120 46.5	59.2	281 20.0	127	15 30.7	+131
20	323 32.4	163 33.2	44.5	164 39.1	21.7	316 01.8	28.5	135 48.7	59.3	295 51.7	127	15 43.8	+131
21	338 34.9	178 34.0	·· 44.3	179 40.1	·· 21.2	331 04.6	·· 28.4	150 50.9	·· 59.4	310 23.4	127	·15 56.9	+129
22	353 37.3	193 34.8	44.1	194 41.1	20.6	346 07.3	28.2	165 53.1	59.5	324 55.1	125	16 09.8	+129
23	8 39.8	208 35.7	43.8	209 42.2	20.1	1 10.1	28.1	180 55.3	59.6	339 26.6	126	16 22.7	+128
24	23 42.3	223 36.5	+ 5 43.6	224 43.2	+10 19.5	16 12.8	+ 1 28.0	195 57.4	− 0 59.7	353 58.2	125	+16 35.5	+127
code	−	+ 9	− 2	+ 10	− 5	+ 27	− 2	+ 22	− 2				

GCT h	SUN GHA ° ′	Dec. ° ′
0	183 21.7	− 7 23.1
1	198 21.8	24.0
2	213 22.0	25.0
3	228 22.1 ••	25.9
4	243 22.3	26.9
5	258 22.5	27.8
6	273 22.6	− 7 28.7
7	288 22.8	29.7
8	303 22.9	30.6
9	318 23.1 ••	31.6
10	333 23.2	32.5
11	348 23.4	33.4
12	3 23.5	− 7 34.4
13	18 23.7	35.3
14	33 23.8	36.2
15	48 24.0 ••	37.2
16	63 24.1	38.1
17	78 24.3	39.0
18	93 24.5	− 7 40.0
19	108 24.6	40.9
20	123 24.8	41.9
21	138 24.9 ••	42.8
22	153 25.1	43.7
23	168 25.2	44.7
0	183 25.4	− 7 45.6
1	198 25.5	46.5
2	213 25.7	47.5
3	228 25.8 ••	48.4
4	243 26.0	49.3
5	258 26.1	50.3
6	273 26.3	− 7 51.2
7	288 26.4	52.1
8	303 26.6	53.1
9	318 26.7 ••	54.0
10	333 26.9	54.9
11	348 27.0	55.9
12	3 27.2	− 7 56.8
13	18 27.3	57.7
14	33 27.5	58.7
15	48 27.6 •	7 59.6
16	63 27.7	8 00.5
17	78 27.9	01.5
18	93 28.0	− 8 02.4
19	108 28.2	03.3
20	123 28.3	04.3
21	138 28.5 ••	05.2
22	153 28.6	06.1
23	168 28.8	07.1
0	183 28.9	− 8 08.0
1	198 29.1	08.9
2	213 29.2	09.8
3	228 29.4 ••	10.8
4	243 29.5	11.7
5	258 29.6	12.6
6	273 29.8	− 8 13.6
7	288 29.9	14.5
8	303 30.1	15.4
9	318 30.2 ••	16.3
10	333 30.4	17.3
11	348 30.5	18.2
12	3 30.6	− 8 19.1
13	18 30.8	20.1
14	33 30.9	21.0
15	48 31.1 ••	21.9
16	63 31.2	22.8
17	78 31.4	23.8
18	93 31.5	− 8 24.7
19	108 31.6	25.6
20	123 31.8	26.5
21	138 31.9 ••	27.5
22	153 32.1	28.4
23	168 32.2	29.3
24	183 32.3	− 8 30.3
code	—	− 9

STARS No.	SHA ° ′	Dec. ° ′	Transit Mer. Gr. h m
1	358 31.3	+28 49.7	22 35
2	358 20.7	+58 53.2	22 36
3	349 42.0	−18 14.9	23 10
4	339 19.9	+59 59.3	23 52
5	336 00.3	−57 28.7	0 09
6	332 18.1	+89 02.3	0 24
7	328 52.9	+23 14.3	0 37
8	315 53.0	−40 29.5	1 29
9	309 46.5	+49 41.6	1 54
10	291 42.4	+16 25.0	3 06
11	281 56.5	− 8 15.0	3 45
12	281 42.8	+45 57.1	3 46
13	279 21.6	+ 6 18.7	3 55
14	279 11.1	+28 34.3	3 56
15	276 33.3	− 1 13.6	4 06
16	271 51.4	+ 7 24.2	4 25
17	264 16.6	−52 39.6	4 55
18	259 14.5	−16 38.6	5 15
19	255 49.0	−28 53.9	5 29
20	245 48.3	+ 5 21.2	6 09
21	244 24.4	+28 08.7	6 14
22	234 37.4	−59 20.8	6 53
23	223 26.9	−43 13.9	7 38
24	221 50.5	−69 30.7	7 44
25	218 41.8	− 8 26.7	7 57
26	208 33.0	+12 12.3	8 37
27	194 48.6	+62 00.6	9 32
28	183 21.2	+14 50.6	10 18
29	174 02.3	−62 49.8	10 55
30	172 53.5	−56 50.5	11 00
31	168 47.4	−59 25.5	11 16
32	167 01.6	+56 13.2	11 23
33	159 30.5	+55 10.6	11 53
34	159 20.5	−10 54.6	11 54
35	153 35.6	+49 33.2	12 17
36	149 02.8	−36 08.1	12 35
37	146 38.3	+19 26.0	12 44
38	140 56.1	−60 38.5	13 07
39	137 18.4	+74 21.2	13 22
40	126 50.5	+26 52.6	14 03
41	120 38.0	−22 29.3	14 28
42	113 23.5	−26 19.7	14 57
43	109 07.4	−68 56.9	15 14
44	103 06.0	−15 40.1	15 38
45	97 25.1	−37 04.5	16 01
46	96 49.7	+12 35.7	16 03
47	91 07.9	+51 29.8	16 26
48	84 45.4	−34 24.8	16 51
49	81 10.5	+38 44.4	17 06
50	76 55.8	−26 21.7	17 22
51	62 53.5	+ 8 44.4	18 18
52	54 31.9	−56 53.8	18 52
53	50 03.1	+45 06.7	19 10
54	34 32.5	+ 9 39.3	20 12
55	28 41.4	−47 11.9	20 35
56	16 14.7	−29 52.7	21 25
57	14 24.3	+14 56.9	21 32

Lat. °	Sunrise h m	Twlt. begins h m	Moonrise 13 h m	14 h m	15 h m	16 h m
N 70	7 05	3 34	16 10	15 42	15 06	13 55
68	6 57	3 45	16 13	15 52	15 27	14 49
66	6 50	3 55	16 16	16 01	15 45	15 22
64	6 44	4 02	16 18	16 09	15 59	15 46
62	6 39	4 09	16 20	16 15	16 11	16 06
60	6 35	4 14	16 22	16 21	16 21	16 22
58	6 31	4 18	16 23	16 26	16 30	16 35
56	6 28	4 22	16 24	16 31	16 38	16 47
54	6 24	4 25	16 26	16 35	16 45	16 58
52	6 22	4 28	16 27	16 38	16 51	17 07
50	6 19	4 30	16 28	16 42	16 57	17 15
45	6 13	4 35	16 30	16 49	17 09	17 33
40	6 09	4 38	16 32	16 55	17 20	17 47
35	6 04	4 40	16 34	17 00	17 29	18 00
30	6 01	4 41	16 35	17 05	17 37	18 11
20	5 54	4 41	16 38	17 14	17 50	18 29
10	5 48	4 38	16 40	17 21	18 02	18 46
0	5 43	4 34	16 43	17 28	18 14	19 01
10	5 37	4 27	16 45	17 35	18 25	19 17
20	5 31	4 17	16 47	17 42	18 38	19 34
30	5 24	4 03	16 50	17 51	18 52	19 53
35	5 20	3 53	16 52	17 56	19 00	20 04
40	5 15	3 42	16 54	18 02	19 10	20 17
45	5 10	3 26	16 56	18 09	19 21	20 33
50	5 03	3 06	16 59	18 17	19 35	20 52
52	5 00	2 56	17 00	18 20	19 41	21 01
54	4 57	2 44	17 01	18 25	19 48	21 12
56	4 53	2 30	17 03	18 29	19 56	21 23
58	4 49	2 13	17 04	18 34	20 05	21 37
60	4 44	1 51	17 06	18 40	20 16	21 53
S						

Lat. °	Sunset h m	Twlt. ends h m	Moonset 13 h m	14 h m	15 h m	16 h m
N 70	16 25	19 52	4 15	6 20	8 33	11 23
68	16 34	19 42	4 16	6 12	8 13	10 30
66	16 41	19 33	4 16	6 06	7 58	9 58
64	16 47	19 26	4 16	6 00	7 45	9 35
62	16 52	19 20	4 17	5 55	7 34	9 16
60	16 56	19 15	4 17	5 51	7 25	9 01
58	17 00	19 11	4 17	5 47	7 17	8 49
56	17 04	19 08	4 17	5 44	7 10	8 38
54	17 07	19 05	4 17	5 41	7 04	8 28
52	17 10	19 02	4 17	5 38	6 59	8 19
50	17 13	19 00	4 18	5 36	6 54	8 12
45	17 18	18 55	4 18	5 31	6 43	7 55
40	17 23	18 53	4 18	5 26	6 34	7 42
35	17 27	18 51	4 18	5 23	6 27	7 31
30	17 31	18 51	4 18	5 19	6 20	7 21
20	17 38	18 51	4 19	5 14	6 09	7 04
10	17 44	18 54	4 19	5 09	5 59	6 50
0	17 50	18 59	4 19	5 04	5 50	6 36
10	17 55	19 06	4 19	4 59	5 40	6 23
20	18 02	19 17	4 19	4 54	5 31	6 08
30	18 09	19 31	4 19	4 49	5 19	5 52
35	18 13	19 41	4 19	4 46	5 13	5 42
40	18 18	19 53	4 20	4 42	5 06	5 32
45	18 24	20 09	4 20	4 38	4 57	5 19
50	18 30	20 29	4 20	4 33	4 47	5 04
52	18 34	20 41	4 20	4 31	4 43	4 57
54	18 37	20 53	4 20	4 28	4 38	4 49
56	18 41	21 08	4 20	4 25	4 32	4 40
58	18 45	21 25	4 20	4 22	4 26	4 30
60	18 50	21 49	4 20	4 19	4 19	4 19
S						

Equation of Time (App.—Mean)

GCT h	13 m s	14 m s	15 m s
0	+13 26.4	+13 41.2	+13 55.4
6	+13 30.1	+13 44.8	+13 58.9
12	+13 33.8	+13 48.3	+14 02.3
18	+13 37.5	+13 51.9	+14 05.7
24	+13 41.2	+13 55.4	+14 09.1

GCT of Transit Meridian of Greenwich

DAY	Moon h m	Venus h m	Mars h m	Jupiter h m	Saturn h m
13	22 53	9 09	9 05	23 04	11 05
14	23 39	9 08	9 04	23 00	11 02
15	24 25	9 06	9 02	22 55	10 58
16	0 25	9 05	9 01	22 51	10 55

ADDITIONAL ALTITUDE CORRECTIONS

Alt. °	Sun's Low'r Limb ′	Venus ′	Mars ′
0			
	0.4	0.3	0.1
30			
	0.4	0.3	0.1
45			
	0.4	0.2	0.0
60			
	0.4	0.1	0.0
75			
	0.4	0.0	0.0
90			

Moon's Lower Limb *Add*

Alt. °	13 ′	14 ′	15 ′
0			
	16.6	15.8	15.2
4			
	16.6	15.8	15.2
8			
	16.6	15.8	15.2
12			
	16.5	15.8	15.2
16			
	16.5	15.8	15.2
20			
	16.5	15.8	15.2
24			
	16.5	15.8	15.2
28			
	16.5	15.8	15.2
32			
	16.4	15.8	15.2
36			
	16.4	15.8	15.2
40			
	16.4	15.8	15.2
44			
	16.3	15.7	15.3
48			
	16.3	15.7	15.3
52			
	16.2	15.7	15.3
56			
	16.2	15.7	15.3
60			
	16.1	15.7	15.3
64			
	16.1	15.7	15.3
68			
	16.0	15.7	15.4
72			
	16.0	15.7	15.4
76			
	15.9	15.6	15.4
80			
	15.9	15.6	15.4
84			
	15.8	15.6	15.4
88			
	15.8	15.6	15.5
90			

Add to table, back cover

Moon's Upper Limb *Subtract*

Alt. °	13 ′	14 ′	15 ′
0			
	15.0	15.4	15.8
4			
	15.0	15.4	15.8
8			
	15.0	15.4	15.8
12			
	15.0	15.4	15.8
16			
	15.0	15.4	15.8
20			
	15.0	15.4	15.7
24			
	15.0	15.4	15.7
28			
	15.1	15.4	15.7
32			
	15.1	15.4	15.7
36			
	15.1	15.4	15.7
40			
	15.2	15.5	15.7
44			
	15.2	15.5	15.7
48			
	15.3	15.5	15.7
52			
	15.3	15.5	15.6
56			
	15.3	15.5	15.6
60			
	15.4	15.5	15.6
64			
	15.4	15.5	15.6
68			
	15.5	15.5	15.6
72			
	15.5	15.6	15.6
76			
	15.6	15.6	15.5
80			
	15.7	15.6	15.5
84			
	15.7	15.6	15.5
88			
	15.8	15.6	15.5
90			

Subtract from table, back cover

First Day of Feast of Tabernacles (Succoth) 15
Full Moon 15

GCT	♈ GHA	VENUS −4.2 GHA	Dec.	MARS 1.9 GHA	Dec.	JUPITER −2.5 GHA	Dec.	SATURN 1.1 GHA	Dec.	MOON GHA	code	Dec.	code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
0	23 42.3	223 36.5	+5 43.6	224 43.2	+10 19.5	16 12.8	+1 28.0	195 57.4	−0 59.7	353 58.2	125	+16 35.5	+127
1	38 44.7	238 37.3	43.4	239 44.2	19.0	31 15.6	27.9	210 59.6	0 59.9	8 29.7	125	16 48.2	+126
2	53 47.2	253 38.2	43.2	254 45.2	18.4	46 18.3	27.8	226 01.8	1 00.0	23 01.2	124	17 00.8	+126
3	68 49.7	268 39.0	·· 43.0	269 46.3	·· 17.9	61 21.1	·· 27.6	241 04.0	·· 00.1	37 32.6	124	·17 13.4	+124
4	83 52.1	283 39.8	42.8	284 47.3	17.3	76 23.8	27.5	256 06.2	00.2	52 04.0	124	17 25.8	+123
5	98 54.6	298 40.7	42.6	299 48.3	16.8	91 26.6	27.4	271 08.4	00.3	66 35.4	123	17 38.1	+123
6	113 57.1	313 41.5	+5 42.4	314 49.3	+10 16.2	106 29.3	+1 27.3	286 10.6	−1 00.4	81 06.7	122	+17 50.4	+121
7	128 59.5	328 42.3	42.1	329 50.4	15.7	121 32.1	27.2	301 12.7	00.6	95 37.9	122	18 02.5	+121
8	144 02.0	343 43.1	41.9	344 51.4	15.1	136 34.8	27.0	316 14.9	00.7	110 09.1	122	18 14.6	+120
9	159 04.5	358 43.9	·· 41.7	359 52.4	·· 14.6	151 37.6	·· 26.9	331 17.1	·· 00.8	124 40.3	121	·18 26.6	+118
10	174 06.9	13 44.7	41.5	14 53.4	14.0	166 40.4	26.8	346 19.3	00.9	139 11.4	121	18 38.4	+118
11	189 09.4	28 45.6	41.3	29 54.4	13.5	181 43.1	26.7	1 21.5	01.0	153 42.5	121	18 50.2	+117
12	204 11.8	43 46.4	+5 41.0	44 55.5	+10 12.9	196 45.9	+1 26.6	16 23.7	−1 01.1	168 13.6	120	+19 01.9	+115
13	219 14.3	58 47.2	40.8	59 56.5	12.4	211 48.6	26.4	31 25.8	01.3	182 44.6	119	19 13.4	+115
14	234 16.8	73 48.0	40.6	74 57.5	11.8	226 51.4	26.3	46 28.0	01.4	197 15.5	119	19 24.9	+114
15	249 19.2	88 48.8	·· 40.4	89 58.5	·· 11.3	241 54.1	·· 26.2	61 30.2	·· 01.5	211 46.4	119	·19 36.3	+112
16	264 21.7	103 49.6	40.1	104 59.6	10.7	256 56.9	26.1	76 32.4	01.6	226 17.3	118	19 47.5	+112
17	279 24.2	118 50.4	39.9	120 00.6	10.2	271 59.6	26.0	91 34.6	01.7	240 48.1	118	19 58.7	+111
18	294 26.6	133 51.2	+5 39.7	135 01.6	+10 09.6	287 02.4	+1 25.9	106 36.8	−1 01.8	255 18.9	117	+20 09.8	+109
19	309 29.1	148 52.0	39.4	150 02.6	09.0	302 05.1	25.7	121 39.0	02.0	269 49.6	117	20 20.7	+109
20	324 31.6	163 52.8	39.2	165 03.7	08.5	317 07.9	25.6	136 41.1	02.1	284 20.3	116	20 31.6	+107
21	339 34.0	178 53.6	·· 39.0	180 04.7	·· 07.9	332 10.6	·· 25.5	151 43.3	·· 02.2	298 50.9	116	·20 42.3	+106
22	354 36.5	193 54.4	38.7	195 05.7	07.4	347 13.4	25.4	166 45.5	02.3	313 21.5	115	20 52.9	+106
23	9 39.0	208 55.2	38.5	210 06.8	06.8	2 16.1	25.3	181 47.7	02.4	327 52.0	115	21 03.5	+104
0	24 41.4	223 56.0	+5 38.3	225 07.8	+10 06.3	17 18.9	+1 25.1	196 49.9	−1 02.5	342 22.5	114	+21 13.9	+103
1	39 43.9	238 56.7	38.0	240 08.8	05.7	32 21.6	25.0	211 52.1	02.6	356 52.9	114	21 24.2	+102
2	54 46.3	253 57.5	37.8	255 09.8	05.2	47 24.4	24.9	226 54.3	02.8	11 23.3	114	21 34.4	+101
3	69 48.8	268 58.3	·· 37.5	270 10.9	·· 04.6	62 27.1	·· 24.8	241 56.4	·· 02.9	25 53.7	113	·21 44.5	+ 99
4	84 51.3	283 59.1	37.3	285 11.9	04.1	77 29.9	24.7	256 58.6	03.0	40 24.0	113	21 54.4	+ 99
5	99 53.7	298 59.9	37.1	300 12.9	03.5	92 32.6	24.5	272 00.8	03.1	54 54.3	112	22 04.3	+ 97
6	114 56.2	314 00.7	+5 36.8	315 13.9	+10 03.0	107 35.4	+1 24.4	287 03.0	−1 03.2	69 24.5	112	+22 14.0	+ 97
7	129 58.7	329 01.4	36.6	330 15.0	02.4	122 38.1	24.3	302 05.2	03.3	83 54.7	111	22 23.7	+ 95
8	145 01.1	344 02.2	36.3	345 16.0	01.9	137 40.9	24.2	317 07.4	03.5	98 24.8	111	22 33.2	+ 94
9	160 03.6	359 03.0	·· 36.1	0 17.0	·· 01.3	152 43.6	·· 24.1	332 09.6	·· 03.6	112 54.9	110	·22 42.6	+ 93
10	175 06.1	14 03.7	35.8	15 18.1	00.8	167 46.4	24.0	347 11.7	03.7	127 24.9	110	22 51.9	+ 91
11	190 08.5	29 04.5	35.6	30 19.1	10 00.2	182 49.1	23.8	2 13.9	03.8	141 54.9	109	23 01.0	+ 91
12	205 11.0	44 05.3	+5 35.3	45 20.1	+9 59.6	197 51.9	+1 23.7	17 16.1	−1 03.9	156 24.8	109	+23 10.1	+ 89
13	220 13.4	59 06.0	35.1	60 21.1	59.1	212 54.6	23.6	32 18.3	04.0	170 54.7	109	23 19.0	+ 88
14	235 15.9	74 06.8	34.8	75 22.2	58.5	227 57.4	23.5	47 20.5	04.2	185 24.6	108	23 27.8	+ 87
15	250 18.4	89 07.6	·· 34.6	90 23.2	·· 58.0	243 00.1	·· 23.4	62 22.7	·· 04.3	199 54.4	108	·23 36.5	+ 85
16	265 20.8	104 08.3	34.3	105 24.2	57.4	258 02.9	23.3	77 24.9	04.4	214 24.2	107	23 45.0	+ 85
17	280 23.3	119 09.1	34.1	120 25.2	56.9	273 05.6	23.1	92 27.0	04.5	228 53.9	107	23 53.5	+ 83
18	295 25.8	134 09.8	+5 33.8	135 26.3	+9 56.3	288 08.4	+1 23.0	107 29.2	−1 04.6	243 23.6	106	+24 01.8	+ 82
19	310 28.2	149 10.6	33.5	150 27.3	55.8	303 11.1	22.9	122 31.4	04.7	257 53.2	106	24 10.0	+ 80
20	325 30.7	164 11.4	33.3	165 28.3	55.2	318 13.9	22.8	137 33.6	04.8	272 22.8	106	24 18.0	+ 80
21	340 33.2	179 12.1	·· 33.0	180 29.4	·· 54.7	333 16.6	·· 22.7	152 35.8	·· 05.0	286 52.4	105	·24 26.0	+ 78
22	355 35.6	194 12.9	32.8	195 30.4	54.1	348 19.4	22.5	167 38.0	05.1	301 21.9	105	24 33.8	+ 77
23	10 38.1	209 13.6	32.5	210 31.4	53.5	3 22.1	22.4	182 40.2	05.2	315 51.4	104	24 41.5	+ 75
0	25 40.6	224 14.3	+5 32.2	225 32.5	+9 53.0	18 24.9	+1 22.3	197 42.3	−1 05.3	330 20.8	104	+24 49.0	+ 75
1	40 43.0	239 15.1	32.0	240 33.5	52.4	33 27.6	22.2	212 44.5	05.4	344 50.2	104	24 56.5	+ 73
2	55 45.5	254 15.8	31.7	255 34.5	51.9	48 30.4	22.1	227 46.7	05.5	359 19.6	103	25 03.8	+ 71
3	70 47.9	269 16.6	·· 31.4	270 35.5	·· 51.3	63 33.1	·· 22.0	242 48.9	·· 05.7	13 48.9	103	·25 10.9	+ 71
4	85 50.4	284 17.3	31.2	285 36.6	50.8	78 35.9	21.8	257 51.1	05.8	28 18.2	103	25 18.0	+ 69
5	100 52.9	299 18.0	30.9	300 37.6	50.2	93 38.6	21.7	272 53.3	05.9	42 47.5	102	25 24.9	+ 68
6	115 55.3	314 18.8	+5 30.6	315 38.6	+9 49.7	108 41.4	+1 21.6	287 55.5	−1 06.0	57 16.7	102	+25 31.7	+ 67
7	130 57.8	329 19.5	30.3	330 39.7	49.1	123 44.1	21.5	302 57.6	06.1	71 45.9	101	25 38.4	+ 65
8	146 00.3	344 20.2	30.1	345 40.7	48.6	138 46.9	21.4	317 59.8	06.2	86 15.0	101	25 44.9	+ 64
9	161 02.7	359 21.0	·· 29.8	0 41.7	·· 48.0	153 49.6	·· 21.3	333 02.0	·· 06.3	100 44.1	101	·25 51.3	+ 62
10	176 05.2	14 21.7	29.5	15 42.8	47.4	168 52.4	21.1	348 04.2	06.5	115 13.2	100	25 57.5	+ 62
11	191 07.7	29 22.4	29.2	30 43.8	46.9	183 55.1	21.0	3 06.4	06.6	129 42.2	101	26 03.7	+ 60
12	206 10.1	44 23.2	+5 29.0	45 44.8	+9 46.3	198 57.9	+1 20.9	18 08.6	−1 06.7	144 11.3	99	+26 09.7	+ 58
13	221 12.6	59 23.9	28.7	60 45.9	45.8	214 00.6	20.8	33 10.8	06.8	158 40.2	100	26 15.5	+ 57
14	236 15.1	74 24.6	28.4	75 46.9	45.2	229 03.4	20.7	48 13.0	06.9	173 09.2	99	26 21.2	+ 56
15	251 17.5	89 25.3	·· 28.1	90 47.9	·· 44.7	244 06.1	·· 20.6	63 15.1	·· 07.0	187 38.1	99	·26 26.8	+ 55
16	266 20.0	104 26.0	27.8	105 49.0	44.1	259 08.8	20.5	78 17.3	07.2	202 07.0	99	26 32.3	+ 53
17	281 22.4	119 26.8	27.5	120 50.0	43.6	274 11.6	20.3	93 19.5	07.3	216 35.9	98	26 37.6	+ 52
18	296 24.9	134 27.5	+5 27.3	135 51.0	+9 43.0	289 14.3	+1 20.2	108 21.7	−1 07.4	231 04.7	99	+26 42.8	+ 50
19	311 27.4	149 28.2	27.0	150 52.0	42.4	304 17.1	20.1	123 23.9	07.5	245 33.6	97	26 47.8	+ 50
20	326 29.8	164 28.9	26.7	165 53.1	41.9	319 19.8	20.0	138 26.1	07.6	260 02.3	98	26 52.8	+ 47
21	341 32.3	179 29.6	·· 26.4	180 54.1	·· 41.3	334 22.6	·· 19.9	153 28.3	·· 07.7	274 31.1	98	·26 57.5	+ 47
22	356 34.8	194 30.3	26.1	195 55.1	40.8	349 25.3	19.8	168 30.4	07.8	288 59.9	97	27 02.2	+ 45
23	11 37.2	209 31.0	25.8	210 56.2	40.2	4 28.1	19.6	183 32.6	08.0	303 28.6	97	27 06.7	+ 43
24	26 39.7	224 31.7	+5 25.5	225 57.2	+9 39.7	19 30.8	+1 19.5	198 34.8	−1 08.1	317 57.3	97	+27 11.0	+ 43
code	—	+7	−2	+10	−5	+27	−1	+22	−1				

GCT	SUN GHA	SUN Dec.
h	° ′	° ′
0	183 32.3	− 8 30.3
1	198 32.5	31.2
2	213 32.6	32.1
3	228 32.8	•• 33.0
4	243 32.9	34.0
5	258 33.0	34.9
6	273 33.2	− 8 35.8
7	288 33.3	36.7
8	303 33.4	37.7
9	318 33.6	•• 38.6
10	333 33.7	39.5
11	348 33.9	40.4
12	3 34.0	− 8 41.3
13	18 34.1	42.3
14	33 34.3	43.2
15	48 34.4	•• 44.1
16	63 34.5	45.0
17	78 34.7	46.0
18	93 34.8	− 8 46.9
19	108 34.9	47.8
20	123 35.1	48.7
21	138 35.2	•• 49.6
22	153 35.3	50.6
23	168 35.5	51.5
0	183 35.6	− 8 52.4
1	198 35.8	53.3
2	213 35.9	54.2
3	228 36.0	•• 55.2
4	243 36.2	56.1
5	258 36.3	57.0
6	273 36.4	− 8 57.9
7	288 36.5	58.8
8	303 36.7	8 59.8
9	318 36.8	• 9 00.7
10	333 36.9	01.6
11	348 37.1	02.5
12	3 37.2	− 9 03.4
13	18 37.3	04.4
14	33 37.5	05.3
15	48 37.6	•• 06.2
16	63 37.7	07.1
17	78 37.9	08.0
18	93 38.0	− 9 08.9
19	108 38.1	09.9
20	123 38.2	10.8
21	138 38.4	•• 11.7
22	153 38.5	12.6
23	168 38.6	13.5
0	183 38.8	− 9 14.4
1	198 38.9	15.3
2	213 39.0	16.3
3	228 39.1	•• 17.2
4	243 39.3	18.1
5	258 39.4	19.0
6	273 39.5	− 9 19.9
7	288 39.6	20.8
8	303 39.8	21.7
9	318 39.9	•• 22.7
10	333 40.0	23.6
11	348 40.1	24.5
12	3 40.3	− 9 25.4
13	18 40.4	26.3
14	33 40.5	27.2
15	48 40.6	•• 28.1
16	63 40.8	29.0
17	78 40.9	30.0
18	93 41.0	− 9 30.9
19	108 41.1	31.8
20	123 41.2	32.7
21	138 41.4	•• 33.6
22	153 41.5	34.5
23	168 41.6	35.4
24	183 41.7	− 9 36.3
code	—	− 10

STARS No.	SHA	Dec.	Transit Mer. Gr.
	° ′	° ′	h m
1	358 31.3	+28 49.7	22 23
2	358 20.7	+58 53.2	22 24
3	349 42.0	−18 14.9	22 59
4	339 19.9	+59 59.3	23 40
5	336 00.3	−57 28.7	23 53
6	332 17.9	+89 02.3	0 12
7	328 52.9	+23 14.3	0 26
8	315 53.0	−40 29.5	1 17
9	309 46.5	+49 41.6	1 42
10	291 42.4	+16 25.0	2 54
11	281 56.4	− 8 15.0	3 33
12	281 42.8	+45 57.1	3 34
13	279 21.6	+ 6 18.7	3 43
14	279 11.1	+28 34.3	3 44
15	276 33.3	− 1 13.6	3 54
16	271 51.4	+ 7 24.2	4 13
17	264 16.6	−52 39.7	4 43
18	259 14.5	−16 38.6	5 03
19	255 48.9	−28 53.9	5 17
20	245 48.2	+ 5 21.2	5 57
21	244 24.3	+28 08.7	6 03
22	234 37.3	−59 20.8	6 42
23	223 26.9	−43 13.9	7 26
24	221 50.4	−69 30.7	7 33
25	218 41.8	− 8 26.7	7 45
26	208 33.0	+12 12.3	8 26
27	194 48.6	+62 00.6	9 20
28	183 21.1	+14 50.6	10 06
29	174 02.3	−62 49.8	10 43
30	172 53.5	−56 50.5	10 48
31	168 47.4	−59 25.5	11 04
32	167 01.6	+56 13.2	11 11
33	159 30.5	+55 10.6	11 41
34	159 20.5	−10 54.6	11 42
35	153 35.6	+49 33.2	12 05
36	149 02.8	−36 08.0	12 23
37	146 38.3	+19 26.0	12 33
38	140 56.1	−60 38.5	12 55
39	137 18.4	+74 21.2	13 10
40	126 50.5	+26 52.6	13 52
41	120 38.1	−22 29.3	14 16
42	113 23.5	−26 19.7	14 45
43	109 07.5	−68 56.9	15 02
44	103 06.0	−15 40.1	15 26
45	97 25.1	−37 04.4	15 49
46	96 49.7	+12 35.7	15 51
47	91 07.9	+51 29.8	16 14
48	84 45.4	−34 24.8	16 39
49	81 10.5	+38 44.4	16 54
50	76 55.8	−26 21.7	17 11
51	62 53.5	+ 8 44.4	18 07
52	54 31.9	−56 53.8	18 40
53	50 03.1	+45 06.7	18 58
54	34 32.5	+ 9 39.3	20 00
55	28 41.4	−47 11.9	20 23
56	16 14.7	−29 52.7	21 13
57	14 24.3	+14 56.9	21 20

Lat.	Sunrise	Twlt. begins	Moonrise 16	17	18	19
N °	h m	h m	h m	h m	h m	h m
70	7 18	3 48	13 55	□	□	□
68	7 08	3 58	14 49	□	□	□
66	7 00	4 05	15 22	14 32	□	□
64	6 53	4 11	15 46	15 28	□	□
62	6 48	4 17	16 06	16 01	15 54	15 39
60	6 42	4 21	16 22	16 25	16 34	16 56
58	6 38	4 25	16 35	16 45	17 02	17 32
56	6 34	4 28	16 47	17 01	17 23	17 58
54	6 30	4 30	16 58	17 15	17 41	18 18
52	6 27	4 33	17 07	17 28	17 56	18 36
50	6 24	4 35	17 15	17 39	18 09	18 50
45	6 17	4 38	17 33	18 01	18 37	19 20
40	6 12	4 41	17 47	18 20	18 58	19 43
35	6 07	4 42	18 00	18 35	19 16	20 03
30	6 03	4 42	18 11	18 49	19 31	20 19
20	5 55	4 41	18 29	19 12	19 58	20 47
10	5 49	4 39	18 46	19 32	20 20	21 11
0	5 42	4 32	19 01	19 51	20 42	21 34
10	5 36	4 25	19 17	20 10	21 03	21 56
20	5 29	4 15	19 34	20 30	21 26	22 21
30	5 21	3 59	19 53	20 54	21 53	22 49
35	5 16	3 49	20 04	21 08	22 09	23 05
40	5 11	3 36	20 17	21 24	22 27	23 25
45	5 04	3 20	20 33	21 43	22 50	23 49
50	4 57	2 58	20 52	22 08	23 18	24 19
52	4 53	2 47	21 01	22 20	23 32	24 34
54	4 49	2 34	21 12	22 33	23 49	24 52
56	4 45	2 18	21 23	22 49	24 08	0 08
58	4 40	1 59	21 37	23 08	24 33	0 33
60	4 35	1 33	21 53	23 31	25 05	1 05
S						

Lat.	Sunset	Twlt. ends	Moonset 16	17	18	19
N °	h m	h m	h m	h m	h m	h m
70	16 11	19 37	11 23	□	□	□
68	16 21	19 28	10 30	□	□	□
66	16 29	19 21	9 58	12 30	□	□
64	16 36	19 15	9 35	11 36	□	□
62	16 42	19 10	9 16	11 03	12 55	14 59
60	16 48	19 07	9 01	10 39	12 16	13 42
58	16 52	19 03	8 49	10 20	11 48	13 06
56	16 56	19 00	8 38	10 04	11 27	12 41
54	17 00	18 58	8 28	9 51	11 10	12 20
52	17 03	18 55	8 19	9 39	10 55	12 03
50	17 06	18 53	8 12	9 29	10 42	11 48
45	17 13	18 51	7 55	9 07	10 16	11 19
40	17 19	18 49	7 42	8 49	9 55	10 56
35	17 24	18 48	7 31	8 35	9 37	10 37
30	17 28	18 48	7 21	8 22	9 22	10 20
20	17 36	18 50	7 04	8 01	8 57	9 53
10	17 42	18 52	6 50	7 42	8 35	9 29
0	17 49	18 59	6 36	7 25	8 15	9 07
10	17 55	19 06	6 23	7 08	7 55	8 45
20	18 03	19 18	6 08	6 49	7 33	8 21
30	18 11	19 34	5 52	6 28	7 08	7 54
35	18 16	19 45	5 42	6 16	6 54	7 38
40	18 21	19 57	5 32	6 01	6 37	7 19
45	18 28	20 15	5 19	5 45	6 16	6 56
50	18 35	20 37	5 04	5 24	5 51	6 27
52	18 39	20 49	4 57	5 15	5 39	6 12
54	18 43	21 02	4 49	5 04	5 25	5 56
56	18 47	21 18	4 40	4 51	5 09	5 36
58	18 52	21 39	4 30	4 37	4 49	5 12
60	18 58	22 07	4 19	4 20	4 25	4 39
S						

GCT	Equation of Time (App.—Mean) 16	17	18
h	m s	m s	m s
0	+14 09.1	+14 22.2	+14 34.8
6	+14 12.4	+14 25.4	+14 37.8
12	+14 15.7	+14 28.6	+14 40.8
18	+14 19.0	+14 31.7	+14 43.8
24	+14 22.2	+14 34.8	+14 46.7

GCT of Transit Meridian of Greenwich

DAY	Moon	Venus	Mars	Jupiter	Saturn
	h m	h m	h m	h m	h m
16	0 25	9 05	9 01	22 51	10 55
17	1 13	9 04	8 59	22 47	10 51
18	2 03	9 03	8 57	22 42	10 48
19	2 54	9 02	8 56	22 38	10 44

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb	Venus	Mars
°	′	′	′
0			
	0.4	0.3	0.1
30			
	0.4	0.2	0.1
45			
	0.4	0.2	0.0
60			
	0.4	0.1	0.0
75			
	0.4	0.0	0.0
90			

Moon's Lower Limb

Add

Alt.	16	17	18
°	′	′	′
0			
	14.4	13.6	13.0
4			
	14.4	13.7	13.0
8			
	14.4	13.7	13.0
12			
	14.4	13.7	13.1
16			
	14.4	13.7	13.1
20			
	14.5	13.8	13.2
24			
	14.5	13.8	13.2
28			
	14.5	13.8	13.3
32			
	14.6	13.9	13.3
36			
	14.6	14.0	13.4
40			
	14.6	14.0	13.5
44			
	14.7	14.1	13.6
48			
	14.7	14.2	13.7
52			
	14.8	14.3	13.8
56			
	14.8	14.3	13.9
60			
	14.9	14.4	14.1
64			
	14.9	14.5	14.2
68			
	15.0	14.6	14.3
72			
	15.1	14.7	14.5
76			
	15.1	14.8	14.6
80			
	15.2	14.9	14.7
84			
	15.2	15.0	14.9
88			
	15.3	15.1	15.0
90			

Add to table, back cover

Moon's Upper Limb

Subtract

Alt.	16	17	18
°	′	′	′
0			
	16.2	16.6	17.0
4			
	16.2	16.6	17.0
8			
	16.2	16.6	17.0
12			
	16.2	16.6	16.9
16			
	16.2	16.6	16.9
20			
	16.1	16.5	16.9
24			
	16.1	16.5	16.8
28			
	16.1	16.4	16.7
32			
	16.1	16.4	16.7
36			
	16.0	16.3	16.6
40			
	16.0	16.3	16.5
44			
	15.9	16.2	16.4
48			
	15.9	16.1	16.3
52			
	15.8	16.0	16.2
56			
	15.8	15.9	16.1
60			
	15.7	15.8	15.9
64			
	15.7	15.8	15.8
68			
	15.6	15.7	15.7
72			
	15.6	15.6	15.6
76			
	15.5	15.5	15.4
80			
	15.4	15.4	15.3
84			
	15.4	15.2	15.1
88			
	15.3	15.2	15.0
90			

Subtract from table, back cover

GCT	♈ GHA	VENUS −4.2 GHA	Dec.	MARS 1.9 GHA	Dec.	JUPITER −2.4 GHA	Dec.	SATURN 1.1 GHA	Dec.	MOON GHA	code	Dec.	code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
0	26 39.7	224 31.7	+ 5 25.5	225 57.2	+ 9 39.7	19 30.8	+ 1 19.5	198 34.8	− 1 08.1	317 57.3	97	+27 11.0	+ 43
1	41 42.2	239 32.4	25.2	240 58.2	39.1	34 33.6	19.4	213 37.0	08.2	332 26.0	96	27 15.3	+ 41
2	56 44.6	254 33.1	24.9	255 59.3	38.6	49 36.3	19.3	228 39.2	08.3	346 54.6	97	27 19.4	+ 39
3	71 47.1	269 33.8	·· 24.6	271 00.3	·· 38.0	64 39.0	·· 19.2	243 41.4	·· 08.4	1 23.3	96	·27 23.3	+ 38
4	86 49.5	284 34.5	24.3	286 01.3	37.4	79 41.8	19.1	258 43.6	08.5	15 51.9	96	27 27.1	+ 37
5	101 52.0	299 35.2	24.0	301 02.4	36.9	94 44.5	19.0	273 45.8	08.6	30 20.5	96	27 30.8	+ 35
6	116 54.5	314 35.9	+ 5 23.7	316 03.4	+ 9 36.3	109 47.3	+ 1 18.8	288 47.9	− 1 08.8	44 49.1	96	+27 34.3	+ 34
7	131 56.9	329 36.6	23.4	331 04.5	35.8	124 50.0	18.7	303 50.1	08.9	59 17.7	96	27 37.7	+ 33
8	146 59.4	344 37.3	23.1	346 05.5	35.2	139 52.8	18.6	318 52.3	09.0	73 46.3	96	27 41.0	+ 31
9	162 01.9	359 38.0	·· 22.8	1 06.5	·· 34.7	154 55.5	·· 18.5	333 54.5	·· 09.1	88 14.9	95	·27 44.1	+ 29
10	177 04.3	14 38.7	22.5	16 07.6	34.1	169 58.2	18.4	348 56.7	09.2	102 43.4	96	27 47.0	+ 29
11	192 06.8	29 39.4	22.2	31 08.6	33.6	185 01.0	18.3	3 58.9	09.3	117 12.0	95	27 49.9	+ 27
12	207 09.3	44 40.1	+ 5 21.9	46 09.6	+ 9 33.0	200 03.7	+ 1 18.2	19 01.1	− 1 09.5	131 40.5	95	+27 52.6	+ 25
13	222 11.7	59 40.7	21.6	61 10.7	32.4	215 06.5	18.0	34 03.3	09.6	146 09.0	96	27 55.1	+ 24
14	237 14.2	74 41.4	21.3	76 11.7	31.9	230 09.2	17.9	49 05.4	09.7	160 37.6	95	27 57.5	+ 23
15	252 16.7	89 42.1	·· 21.0	91 12.7	·· 31.3	245 12.0	·· 17.8	64 07.6	·· 09.8	175 06.1	95	·27 59.8	+ 21
16	267 19.1	104 42.8	20.7	106 13.8	30.8	260 14.7	17.7	79 09.8	09.9	189 34.6	95	28 01.9	+ 20
17	282 21.6	119 43.5	20.4	121 14.8	30.2	275 17.5	17.6	94 12.0	10.0	204 03.1	95	28 03.9	+ 19
18	297 24.0	134 44.1	+ 5 20.1	136 15.8	+ 9 29.7	290 20.2	+ 1 17.5	109 14.2	− 1 10.1	218 31.6	95	+28 05.8	+ 17
19	312 26.5	149 44.8	19.7	151 16.9	29.1	305 22.9	17.4	124 16.4	10.3	233 00.1	96	28 07.5	+ 16
20	327 29.0	164 45.5	19.4	166 17.9	28.5	320 25.7	17.2	139 18.6	10.4	247 28.7	95	28 09.1	+ 14
21	342 31.4	179 46.1	·· 19.1	181 18.9	·· 28.0	335 28.4	·· 17.1	154 20.8	·· 10.5	261 57.2	95	·28 10.5	+ 13
22	357 33.9	194 46.8	18.8	196 20.0	27.4	350 31.2	17.0	169 22.9	10.6	276 25.7	95	28 11.8	+ 11
23	12 36.4	209 47.5	18.5	211 21.0	26.9	5 33.9	16.9	184 25.1	10.7	290 54.2	95	28 12.9	+ 10
0	27 38.8	224 48.1	+ 5 18.2	226 22.1	+ 9 26.3	20 36.6	+ 1 16.8	199 27.3	− 1 10.8	305 22.7	96	+28 13.9	+ 9
1	42 41.3	239 48.8	17.8	241 23.1	25.8	35 39.4	16.7	214 29.5	10.9	319 51.3	95	28 14.8	+ 7
2	57 43.8	254 49.5	17.5	256 24.1	25.2	50 42.1	16.6	229 31.7	11.1	334 19.8	96	28 15.5	+ 6
3	72 46.2	269 50.1	·· 17.2	271 25.2	·· 24.6	65 44.9	·· 16.5	244 33.9	·· 11.2	348 48.4	96	·28 16.1	+ 5
4	87 48.7	284 50.8	16.9	286 26.2	24.1	80 47.6	16.3	259 36.1	11.3	3 17.0	95	28 16.6	+ 3
5	102 51.2	299 51.4	16.5	301 27.2	23.5	95 50.3	16.2	274 38.3	11.4	17 45.5	96	28 16.9	+ 1
6	117 53.6	314 52.1	+ 5 16.2	316 28.3	+ 9 23.0	110 53.1	+ 1 16.1	289 40.4	− 1 11.5	32 14.1	96	+28 17.0	+ 1
7	132 56.1	329 52.8	15.9	331 29.3	22.4	125 55.8	16.0	304 42.6	11.6	46 42.7	96	28 17.1	− 1
8	147 58.5	344 53.4	15.6	346 30.4	21.9	140 58.6	15.9	319 44.8	11.7	61 11.3	97	28 17.0	− 3
9	163 01.0	359 54.1	·· 15.2	1 31.4	·· 21.3	156 01.3	·· 15.8	334 47.0	·· 11.9	75 40.0	96	·28 16.7	− 4
10	178 03.5	14 54.7	14.9	16 32.4	20.7	171 04.0	15.7	349 49.2	12.0	90 08.6	97	28 16.3	− 5
11	193 05.9	29 55.4	14.6	31 33.5	20.2	186 06.8	15.6	4 51.4	12.1	104 37.3	97	28 15.8	− 7
12	208 08.4	44 56.0	+ 5 14.2	46 34.5	+ 9 19.6	201 09.5	+ 1 15.4	19 53.6	− 1 12.2	119 06.0	97	+28 15.1	− 8
13	223 10.9	59 56.7	13.9	61 35.5	19.1	216 12.3	15.3	34 55.8	12.3	133 34.7	97	28 14.3	− 9
14	238 13.3	74 57.3	13.6	76 36.6	18.5	231 15.0	15.2	49 58.0	12.4	148 03.4	98	28 13.4	− 11
15	253 15.8	89 57.9	·· 13.2	91 37.6	·· 17.9	246 17.7	·· 15.1	65 00.1	·· 12.5	162 32.2	98	·28 12.3	− 12
16	268 18.3	104 58.6	12.9	106 38.7	17.4	261 20.5	15.0	80 02.3	12.7	177 01.0	98	28 11.1	− 14
17	283 20.7	119 59.2	12.6	121 39.7	16.8	276 23.2	14.9	95 04.5	12.8	191 29.8	98	28 09.7	− 14
18	298 23.2	134 59.9	+ 5 12.2	136 40.7	+ 9 16.3	291 26.0	+ 1 14.8	110 06.7	− 1 12.9	205 58.6	99	+28 08.3	− 17
19	313 25.7	150 00.5	11.9	151 41.8	15.7	306 28.7	14.7	125 08.9	13.0	220 27.5	98	28 06.6	− 17
20	328 28.1	165 01.1	11.5	166 42.8	15.2	321 31.4	14.5	140 11.1	13.1	234 56.3	100	28 04.9	− 19
21	343 30.6	180 01.8	·· 11.2	181 43.9	·· 14.6	336 34.2	·· 14.4	155 13.3	·· 13.2	249 25.3	99	·28 03.0	− 21
22	358 33.0	195 02.4	10.8	196 44.9	14.0	351 36.9	14.3	170 15.5	13.3	263 54.2	100	28 00.9	− 21
23	13 35.5	210 03.0	10.5	211 45.9	13.5	6 39.7	14.2	185 17.6	13.5	278 23.2	100	27 58.8	− 23
0	28 38.0	225 03.6	+ 5 10.2	226 47.0	+ 9 12.9	21 42.4	+ 1 14.1	200 19.8	− 1 13.6	292 52.2	100	+27 56.5	− 25
1	43 40.4	240 04.3	09.8	241 48.0	12.4	36 45.1	14.0	215 22.0	13.7	307 21.2	101	27 54.0	− 25
2	58 42.9	255 04.9	09.5	256 49.1	11.8	51 47.9	13.9	230 24.2	13.8	321 50.3	101	27 51.5	− 27
3	73 45.4	270 05.5	·· 09.1	271 50.1	·· 11.2	66 50.6	·· 13.8	245 26.4	·· 13.9	336 19.4	101	·27 48.8	− 29
4	88 47.8	285 06.1	08.8	286 51.1	10.7	81 53.3	13.7	260 28.6	14.0	350 48.5	102	27 45.9	− 30
5	103 50.3	300 06.8	08.4	301 52.2	10.1	96 56.1	13.5	275 30.8	14.1	5 17.7	102	27 42.9	− 31
6	118 52.8	315 07.4	+ 5 08.1	316 53.2	+ 9 09.6	111 58.8	+ 1 13.4	290 33.0	− 1 14.2	19 46.9	103	+27 39.8	− 32
7	133 55.2	330 08.0	07.7	331 54.3	09.0	127 01.5	13.3	305 35.2	14.4	34 16.2	103	27 36.6	− 34
8	148 57.7	345 08.6	07.3	346 55.3	08.5	142 04.3	13.2	320 37.3	14.5	48 45.5	103	27 33.2	− 35
9	164 00.1	0 09.2	·· 07.0	1 56.3	·· 07.9	157 07.0	·· 13.1	335 39.5	·· 14.6	63 14.8	104	·27 29.7	− 36
10	179 02.6	15 09.8	06.6	16 57.4	07.3	172 09.8	13.0	350 41.7	14.7	77 44.2	104	27 26.1	− 37
11	194 05.1	30 10.4	06.3	31 58.4	06.8	187 12.5	12.9	5 43.9	14.8	92 13.6	105	27 22.4	− 39
12	209 07.5	45 11.1	+ 5 05.9	46 59.5	+ 9 06.2	202 15.2	+ 1 12.8	20 46.1	− 1 14.9	106 43.1	105	+27 18.5	− 40
13	224 10.0	60 11.7	05.6	62 00.5	05.7	217 18.0	12.7	35 48.3	15.0	121 12.6	105	27 14.5	− 42
14	239 12.5	75 12.3	05.2	77 01.6	05.1	232 20.7	12.5	50 50.5	15.2	135 42.1	106	27 10.3	− 42
15	254 14.9	90 12.9	·· 04.8	92 02.6	·· 04.5	247 23.4	·· 12.4	65 52.7	·· 15.3	150 11.7	106	·27 06.1	− 44
16	269 17.4	105 13.5	04.5	107 03.6	04.0	262 26.2	12.3	80 54.9	15.4	164 41.3	107	27 01.7	− 46
17	284 19.9	120 14.1	04.1	122 04.7	03.4	277 28.9	12.2	95 57.0	15.5	179 11.0	107	26 57.1	− 46
18	299 22.3	135 14.7	+ 5 03.7	137 05.7	+ 9 02.9	292 31.6	+ 1 12.1	110 59.2	− 1 15.6	193 40.7	108	+26 52.5	− 48
19	314 24.8	150 15.3	03.4	152 06.8	02.3	307 34.4	12.0	126 01.4	15.7	208 10.5	108	26 47.7	− 49
20	329 27.3	165 15.9	03.0	167 07.8	01.7	322 37.1	11.9	141 03.6	15.8	222 40.3	108	26 42.8	− 50
21	344 29.7	180 16.5	·· 02.6	182 08.9	·· 01.2	337 39.8	·· 11.8	156 05.8	·· 16.0	237 10.1	110	·26 37.8	− 52
22	359 32.2	195 17.1	02.3	197 09.9	00.6	352 42.6	11.7	171 08.0	16.1	251 40.1	109	26 32.6	− 52
23	14 34.6	210 17.7	01.9	212 10.9	9 00.1	7 45.3	11.6	186 10.2	16.2	266 10.0	110	26 27.4	− 54
24	29 37.1	225 18.3	+ 5 01.5	227 12.0	+ 8 59.5	22 48.0	+ 1 11.4	201 12.4	− 1 16.3	280 40.0	111	+26 22.0	− 55
code	—	+ 7	− 3	+ 10	− 5	+ 28	− 1	+ 22	− 1				

GCT	SUN GHA	SUN Dec.
h	° ′	° ′
0	183 41.7	− 9 36.3
1	198 41.9	37.2
2	213 42.0	38.1
3	228 42.1	•• 39.1
4	243 42.2	40.0
5	258 42.3	40.9
6	273 42.5	− 9 41.8
7	288 42.6	42.7
8	303 42.7	43.6
9	318 42.8	•• 44.5
10	333 42.9	45.4
11	348 43.1	46.3
12	3 43.2	− 9 47.2
13	18 43.3	48.1
14	33 43.4	49.0
15	48 43.5	•• 49.9
16	63 43.6	50.9
17	78 43.8	51.8
18	93 43.9	− 9 52.7
19	108 44.0	53.6
20	123 44.1	54.5
21	138 44.2	•• 55.4
22	153 44.3	56.3
23	168 44.5	57.2
0	183 44.6	− 9 58.1
1	198 44.7	59.0
2	213 44.8	9 59.9
3	228 44.9	·10 00.8
4	243 45.0	01.7
5	258 45.1	02.6
6	273 45.2	−10 03.5
7	288 45.4	04.4
8	303 45.5	05.3
9	318 45.6	•• 06.2
10	333 45.7	07.1
11	348 45.8	08.0
12	3 45.9	−10 08.9
13	18 46.0	09.8
14	33 46.1	10.7
15	48 46.3	•• 11.6
16	63 46.4	12.5
17	78 46.5	13.4
18	93 46.6	−10 14.3
19	108 46.7	15.2
20	123 46.8	16.1
21	138 46.9	•• 17.0
22	153 47.0	17.9
23	168 47.1	18.8
0	183 47.2	−10 19.7
1	198 47.3	20.6
2	213 47.4	21.5
3	228 47.6	•• 22.4
4	243 47.7	23.3
5	258 47.8	24.2
6	273 47.9	−10 25.1
7	288 48.0	26.0
8	303 48.1	26.9
9	318 48.2	•• 27.8
10	333 48.3	28.7
11	348 48.4	29.6
12	3 48.5	−10 30.5
13	18 48.6	31.4
14	33 48.7	32.2
15	48 48.8	•• 33.1
16	63 48.9	34.0
17	78 49.0	34.9
18	93 49.1	−10 35.8
19	108 49.2	36.7
20	123 49.3	37.6
21	138 49.4	•• 38.5
22	153 49.5	39.4
23	168 49.6	40.3
24	183 49.7	−10 41.2
code	—	− 9

STARS No.	SHA	Dec.	Transit Mer. Gr.
	° ′	° ′	h m
1	358 31.3	+28 49.7	22 12
2	358 20.7	+58 53.3	22 12
3	349 42.0	−18 14.9	22 47
4	339 19.9	+59 59.3	23 28
5	336 00.3	−57 28.7	23 41
6	332 17.7	+89 02.4	0 00
7	328 52.9	+23 14.3	0 14
8	315 53.0	−40 29.5	1 06
9	309 46.5	+49 41.6	1 30
10	291 42.4	+16 25.0	2 42
11	281 56.4	− 8 15.0	3 21
12	281 42.8	+45 57.1	3 22
13	279 21.6	+ 6 18.7	3 31
14	279 11.1	+28 34.3	3 32
15	276 33.2	− 1 13.6	3 43
16	271 51.3	+ 7 24.2	4 01
17	264 16.6	−52 39.7	4 32
18	259 14.5	−16 38.6	4 52
19	255 48.9	−28 53.9	5 05
20	245 48.2	+ 5 21.2	5 45
21	244 24.3	+28 08.7	5 51
22	234 37.3	−59 20.8	6 30
23	223 26.9	−43 13.9	7 14
24	221 50.4	−69 30.7	7 21
25	218 41.8	− 8 26.7	7 33
26	208 33.0	+12 12.3	8 14
27	194 48.6	+62 00.6	9 09
28	183 21.1	+14 50.5	9 54
29	174 02.3	−62 49.8	10 32
30	172 53.5	−56 50.5	10 36
31	168 47.4	−59 25.4	10 52
32	167 01.6	+56 13.2	11 00
33	159 30.5	+55 10.5	11 29
34	159 20.5	−10 54.6	11 30
35	153 35.6	+49 33.2	11 53
36	149 02.8	−36 08.0	12 11
37	146 38.3	+19 26.0	12 21
38	140 56.1	−60 38.4	12 44
39	137 18.4	+74 21.1	12 58
40	126 50.5	+26 52.6	13 40
41	120 38.1	−22 29.3	14 05
42	113 23.5	−26 19.7	14 33
43	109 07.5	−68 56.8	14 50
44	103 06.0	−15 40.1	15 15
45	97 25.2	−37 04.4	15 37
46	96 49.7	+12 35.6	15 40
47	91 07.9	+51 29.8	16 02
48	84 45.4	−34 24.8	16 28
49	81 10.5	+38 44.4	16 42
50	76 55.8	−26 21.7	16 59
51	62 53.5	+ 8 44.4	17 55
52	54 32.0	−56 53.8	18 28
53	50 03.1	+45 06.7	18 46
54	34 32.5	+ 9 39.3	19 48
55	28 41.4	−47 11.9	20 11
56	16 14.7	−29 52.7	21 01
57	14 24.3	+14 56.9	21 08

Lat.	Sunrise	Twlt. begins	Moonrise 19	Moonrise 20	Moonrise 21	Moonrise 22
N °	h m	h m	h m	h m	h m	h m
70	7 31	4 00	▭	▭	▭	▭
68	7 20	4 08	▭	▭	▭	▭
66	7 11	4 15	▭	▭	▭	▭
64	7 03	4 20	▭	▭	▭	19 29
62	6 56	4 25	15 39	▭	18 20	20 09
60	6 50	4 28	16 56	17 46	19 05	20 36
58	6 45	4 31	17 32	18 23	19 35	20 58
56	6 40	4 34	17 58	18 50	19 57	21 15
54	6 36	4 36	18 18	19 10	20 16	21 30
52	6 32	4 38	18 36	19 28	20 31	21 42
50	6 29	4 39	18 50	19 43	20 45	21 53
45	6 21	4 42	19 20	20 13	21 12	22 17
40	6 15	4 44	19 43	20 36	21 34	22 35
35	6 10	4 45	20 03	20 55	21 52	22 51
30	6 05	4 44	20 19	21 12	22 07	23 04
20	5 56	4 42	20 47	21 39	22 33	23 27
10	5 49	4 39	21 11	22 03	22 56	23 47
0	5 42	4 32	21 34	22 26	23 16	24 05
10	5 34	4 24	21 56	22 48	23 37	24 23
20	5 27	4 11	22 21	23 12	23 59	24 43
30	5 18	3 56	22 49	23 40	24 25	0 25
35	5 12	3 44	23 05	23 56	24 40	0 40
40	5 06	3 31	23 25	24 15	0 15	0 58
45	4 59	3 13	23 49	24 39	0 39	1 19
50	4 51	2 50	24 19	0 19	1 08	1 45
52	4 47	2 37	24 34	0 34	1 23	1 58
54	4 43	2 23	24 52	0 52	1 40	2 13
56	4 38	2 06	0 08	1 14	2 00	2 30
58	4 33	1 44	0 33	1 41	2 26	2 51
60	4 26	1 12	1 05	2 20	3 01	3 17
S						

Lat.	Sunset	Twlt. ends	Moonset 19	Moonset 20	Moonset 21	Moonset 22
N °	h m	h m	h m	h m	h m	h m
70	15 57	19 24	▭	▭	▭	▭
68	16 09	19 17	▭	▭	▭	▭
66	16 18	19 10	▭	▭	▭	▭
64	16 26	19 05	▭	▭	▭	16 27
62	16 33	19 01	14 59	▭	15 53	15 46
60	16 39	18 58	13 42	14 40	15 07	15 18
58	16 44	18 55	13 06	14 03	14 37	14 56
56	16 49	18 53	12 41	13 37	14 15	14 38
54	16 53	18 51	12 20	13 16	13 56	14 23
52	16 57	18 49	12 03	12 58	13 40	14 10
50	17 00	18 48	11 48	12 44	13 26	13 59
45	17 08	18 46	11 19	12 13	12 58	13 34
40	17 14	18 44	10 56	11 50	12 36	13 15
35	17 20	18 44	10 37	11 30	12 18	12 59
30	17 25	18 45	10 20	11 14	12 02	12 45
20	17 33	18 47	9 53	10 46	11 35	12 21
10	17 41	18 52	9 29	10 22	11 12	12 00
0	17 48	18 58	9 07	9 59	10 50	11 40
10	17 56	19 07	8 45	9 36	10 29	11 20
20	18 04	19 20	8 21	9 12	10 05	10 59
30	18 13	19 37	7 54	8 44	9 38	10 35
35	18 18	19 47	7 38	8 27	9 22	10 20
40	18 24	20 01	7 19	8 08	9 03	10 03
45	18 32	20 20	6 56	7 44	8 40	9 43
50	18 40	20 44	6 27	7 13	8 11	9 17
52	18 44	20 57	6 12	6 58	7 56	9 04
54	18 49	21 12	5 56	6 40	7 39	8 50
56	18 53	21 29	5 36	6 19	7 19	8 33
58	18 59	21 53	5 12	5 51	6 54	8 13
60	19 05	22 28	4 39	5 12	6 19	7 47
S						

Equation of Time (App.—Mean)

GCT	19	20	21
h	m s	m s	m s
0	+14 46.7	+14 58.0	+15 08.7
6	+14 49.6	+15 00.8	+15 11.3
12	+14 52.5	+15 03.5	+15 13.8
18	+14 55.3	+15 06.1	+15 16.3
24	+14 58.0	+15 08.7	+15 18.8

GCT of Transit Meridian of Greenwich

DAY	Moon	Venus	Mars	Jupiter	Saturn
	h m	h m	h m	h m	h m
19	2 54	9 02	8 56	22 38	10 44
20	3 46	9 00	8 54	22 33	10 41
21	4 38	8 59	8 52	22 29	10 37
22	5 28	8 58	8 51	22 25	10 34

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb	Venus	Mars
°	′	′	′
0			
	0.4	0.3	0.1
30			
	0.4	0.2	0.1
45			
	0.4	0.2	0.0
60			
	0.4	0.1	0.0
75			
	0.4	0.0	0.0
90			

Moon's Lower Limb
Add

Alt.	19	20	21
°	′	′	′
0			
	12.5	12.1	12.0
4			
	12.5	12.1	12.0
8			
	12.5	12.2	12.0
12			
	12.6	12.2	12.1
16			
	12.6	12.2	12.1
20			
	12.7	12.3	12.2
24			
	12.7	12.4	12.3
28			
	12.8	12.5	12.4
32			
	12.9	12.6	12.5
36			
	13.0	12.7	12.6
40			
	13.1	12.8	12.7
44			
	13.2	12.9	12.8
48			
	13.4	13.1	13.0
52			
	13.5	13.2	13.1
56			
	13.6	13.4	13.3
60			
	13.8	13.5	13.5
64			
	13.9	13.7	13.6
68			
	14.1	13.9	13.8
72			
	14.2	14.1	14.0
76			
	14.4	14.3	14.2
80			
	14.6	14.4	14.4
84			
	14.7	14.6	14.6
88			
	14.9	14.8	14.7
90			

Add to table, back cover

Moon's Upper Limb
Subtract

Alt.	19	20	21
°	′	′	′
0			
	17.3	17.5	17.6
4			
	17.3	17.5	17.6
8			
	17.3	17.5	17.5
12			
	17.2	17.4	17.5
16			
	17.2	17.4	17.5
20			
	17.1	17.3	17.4
24			
	17.1	17.2	17.3
28			
	17.0	17.2	17.2
32			
	16.9	17.1	17.1
36			
	16.8	16.9	17.0
40			
	16.7	16.8	16.9
44			
	16.6	16.7	16.7
48			
	16.4	16.6	16.6
52			
	16.3	16.4	16.4
56			
	16.2	16.2	16.3
60			
	16.0	16.1	16.1
64			
	15.9	15.9	15.9
68			
	15.7	15.7	15.7
72			
	15.6	15.6	15.6
76			
	15.4	15.4	15.4
80			
	15.2	15.2	15.2
84			
	15.1	15.0	15.0
88			
	14.9	14.9	14.8
90			

Subtract from table, back cover

GCT	♈ GHA	VENUS −4.2 GHA	VENUS Dec.	MARS 1.8 GHA	MARS Dec.	JUPITER −2.4 GHA	JUPITER Dec.	SATURN 1.1 GHA	SATURN Dec.	MOON GHA	code	MOON Dec.	code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
0	29 37.1	225 18.3	+ 5 01.5	227 12.0	+ 8 59.5	22 48.0	+ 1 11.4	201 12.4	− 1 16.3	280 40.0	111	+26 22.0	− 55
1	44 39.6	240 18.8	01.2	242 13.0	58.9	37 50.8	11.3	216 14.6	16.4	295 10.1	111	26 16.5	− 57
2	59 42.0	255 19.4	00.8	257 14.1	58.4	52 53.5	11.2	231 16.7	16.5	309 40.2	111	26 10.8	− 57
3	74 44.5	270 20.0	·· 00.4	272 15.1	·· 57.8	67 56.2	·· 11.1	246 18.9	·· 16.6	324 10.3	113	·26 05.1	− 59
4	89 47.0	285 20.6	5 00.0	287 16.2	57.3	82 59.0	11.0	261 21.1	16.7	338 40.6	112	25 59.2	− 60
5	104 49.4	300 21.2	4 59.7	302 17.2	56.7	98 01.7	10.9	276 23.3	16.9	353 10.8	113	25 53.2	− 61
6	119 51.9	315 21.8	+ 4 59.3	317 18.2	+ 8 56.1	113 04.4	+ 1 10.8	291 25.5	− 1 17.0	7 41.1	114	+25 47.1	− 63
7	134 54.4	330 22.4	58.9	332 19.3	55.6	128 07.2	10.7	306 27.7	17.1	22 11.5	114	25 40.8	− 63
8	149 56.8	345 22.9	58.5	347 20.3	55.0	143 09.9	10.6	321 29.9	17.2	36 41.9	115	25 34.5	− 65
9	164 59.3	0 23.5	·· 58.1	2 21.4	·· 54.5	158 12.6	·· 10.5	336 32.1	·· 17.3	51 12.4	115	·25 28.0	− 66
10	180 01.8	15 24.1	57.8	17 22.4	53.9	173 15.4	10.4	351 34.3	17.4	65 42.9	116	25 21.4	− 67
11	195 04.2	30 24.7	57.4	32 23.5	53.3	188 18.1	10.2	6 36.5	17.5	80 13.5	116	25 14.7	− 68
12	210 06.7	45 25.2	+ 4 57.0	47 24.5	+ 8 52.8	203 20.8	+ 1 10.1	21 38.6	− 1 17.7	94 44.1	117	+25 07.9	− 69
13	225 09.1	60 25.8	56.6	62 25.6	52.2	218 23.6	10.0	36 40.8	17.8	109 14.8	117	25 01.0	− 71
14	240 11.6	75 26.4	56.2	77 26.6	51.7	233 26.3	09.9	51 43.0	17.9	123 45.5	118	24 53.9	− 71
15	255 14.1	90 27.0	·· 55.8	92 27.6	·· 51.1	248 29.0	·· 09.8	66 45.2	·· 18.0	138 16.3	119	·24 46.8	− 73
16	270 16.5	105 27.5	55.4	107 28.7	50.5	263 31.8	09.7	81 47.4	18.1	152 47.2	119	24 39.5	− 74
17	285 19.0	120 28.1	55.0	122 29.7	50.0	278 34.5	09.6	96 49.6	18.2	167 18.1	119	24 32.1	− 75
18	300 21.5	135 28.7	+ 4 54.7	137 30.8	+ 8 49.4	293 37.2	+ 1 09.5	111 51.8	− 1 18.3	181 49.0	120	+24 24.6	− 76
19	315 23.9	150 29.2	54.3	152 31.8	48.9	308 39.9	09.4	126 54.0	18.4	196 20.0	121	24 17.0	− 77
20	330 26.4	165 29.8	53.9	167 32.9	48.3	323 42.7	09.3	141 56.2	18.6	210 51.1	121	24 09.3	− 78
21	345 28.9	180 30.3	·· 53.5	182 33.9	·· 47.7	338 45.4	·· 09.2	156 58.4	·· 18.7	225 22.2	122	·24 01.5	− 79
22	0 31.3	195 30.9	53.1	197 35.0	47.2	353 48.1	09.1	172 00.5	18.8	239 53.4	122	23 53.6	− 81
23	15 33.8	210 31.5	52.7	212 36.0	46.6	8 50.9	09.0	187 02.7	18.9	254 24.6	123	23 45.5	− 81
0	30 36.3	225 32.0	+ 4 52.3	227 37.1	+ 8 46.1	23 53.6	+ 1 08.8	202 04.9	− 1 19.0	268 55.9	123	+23 37.4	− 83
1	45 38.7	240 32.6	51.9	242 38.1	45.5	38 56.3	08.7	217 07.1	19.1	283 27.2	124	23 29.1	− 83
2	60 41.2	255 33.1	51.5	257 39.2	44.9	53 59.1	08.6	232 09.3	19.2	297 58.6	124	23 20.8	− 85
3	75 43.6	270 33.7	·· 51.1	272 40.2	·· 44.4	69 01.8	·· 08.5	247 11.5	·· 19.3	312 30.0	125	·23 12.3	− 86
4	90 46.1	285 34.2	50.7	287 41.2	43.8	84 04.5	08.4	262 13.7	19.5	327 01.5	126	23 03.7	− 87
5	105 48.6	300 34.8	50.3	302 42.3	43.3	99 07.2	08.3	277 15.9	19.6	341 33.1	126	22 55.0	− 87
6	120 51.0	315 35.3	+ 4 49.9	317 43.3	+ 8 42.7	114 10.0	+ 1 08.2	292 18.1	− 1 19.7	356 04.7	126	+22 46.3	− 89
7	135 53.5	330 35.9	49.5	332 44.4	42.1	129 12.7	08.1	307 20.3	19.8	10 36.3	128	22 37.4	− 90
8	150 56.0	345 36.4	49.1	347 45.4	41.6	144 15.4	08.0	322 22.5	19.9	25 08.1	127	22 28.4	− 91
9	165 58.4	0 37.0	·· 48.7	2 46.5	·· 41.0	159 18.2	·· 07.9	337 24.6	·· 20.0	39 39.8	128	·22 19.3	− 92
10	181 00.9	15 37.5	48.3	17 47.5	40.4	174 20.9	07.8	352 26.8	20.1	54 11.6	129	22 10.1	− 92
11	196 03.4	30 38.1	47.9	32 48.6	39.9	189 23.6	07.7	7 29.0	20.2	68 43.5	129	22 00.9	− 94
12	211 05.8	45 38.6	+ 4 47.5	47 49.6	+ 8 39.3	204 26.3	+ 1 07.6	22 31.2	− 1 20.4	83 15.4	130	+21 51.5	− 95
13	226 08.3	60 39.1	47.0	62 50.7	38.8	219 29.1	07.5	37 33.4	20.5	97 47.4	130	21 42.0	− 96
14	241 10.7	75 39.7	46.6	77 51.7	38.2	234 31.8	07.4	52 35.6	20.6	112 19.4	131	21 32.4	− 96
15	256 13.2	90 40.2	·· 46.2	92 52.8	·· 37.6	249 34.5	·· 07.2	67 37.8	·· 20.7	126 51.5	131	·21 22.8	− 98
16	271 15.7	105 40.7	45.8	107 53.8	37.1	264 37.2	07.1	82 40.0	20.8	141 23.6	132	21 13.0	− 99
17	286 18.1	120 41.3	45.4	122 54.9	36.5	279 40.0	07.0	97 42.2	20.9	155 55.8	132	21 03.1	− 99
18	301 20.6	135 41.8	+ 4 45.0	137 55.9	+ 8 36.0	294 42.7	+ 1 06.9	112 44.4	− 1 21.0	170 28.0	133	+20 53.2	−101
19	316 23.1	150 42.3	44.6	152 57.0	35.4	309 45.4	06.8	127 46.5	21.1	185 00.3	133	20 43.1	−101
20	331 25.5	165 42.9	44.1	167 58.0	34.8	324 48.1	06.7	142 48.7	21.3	199 32.6	134	20 33.0	−103
21	346 28.0	180 43.4	·· 43.7	182 59.1	·· 34.3	339 50.9	·· 06.6	157 50.9	·· 21.4	214 05.0	135	·20 22.7	−103
22	1 30.5	195 43.9	43.3	198 00.1	33.7	354 53.6	06.5	172 53.1	21.5	228 37.5	134	20 12.4	−104
23	16 32.9	210 44.5	42.9	213 01.2	33.1	9 56.3	06.4	187 55.3	21.6	243 09.9	136	20 02.0	−105
0	31 35.4	225 45.0	+ 4 42.5	228 02.2	+ 8 32.6	24 59.0	+ 1 06.3	202 57.5	− 1 21.7	257 42.5	135	+19 51.5	−106
1	46 37.9	240 45.5	42.0	243 03.3	32.0	40 01.8	06.2	217 59.7	21.8	272 15.0	136	19 40.9	−107
2	61 40.3	255 46.0	41.6	258 04.3	31.5	55 04.5	06.1	233 01.9	21.9	286 47.6	137	19 30.2	−108
3	76 42.8	270 46.5	·· 41.2	273 05.4	·· 30.9	70 07.2	·· 06.0	248 04.1	·· 22.0	301 20.3	137	·19 19.4	−109
4	91 45.2	285 47.1	40.8	288 06.4	30.3	85 09.9	05.9	263 06.3	22.2	315 53.0	138	19 08.5	−109
5	106 47.7	300 47.6	40.3	303 07.5	29.8	100 12.7	05.8	278 08.5	22.3	330 25.8	138	18 57.6	−111
6	121 50.2	315 48.1	+ 4 39.9	318 08.5	+ 8 29.2	115 15.4	+ 1 05.7	293 10.7	− 1 22.4	344 58.6	138	+18 46.5	−111
7	136 52.6	330 48.6	39.5	333 09.6	28.6	130 18.1	05.6	308 12.8	22.5	359 31.4	139	18 35.4	−112
8	151 55.1	345 49.1	39.1	348 10.6	28.1	145 20.8	05.5	323 15.0	22.6	14 04.3	139	18 24.2	−113
9	166 57.6	0 49.6	·· 38.6	3 11.7	·· 27.5	160 23.6	·· 05.4	338 17.2	·· 22.7	28 37.2	140	·18 12.9	−114
10	182 00.0	15 50.2	38.2	18 12.7	27.0	175 26.3	05.3	353 19.4	22.8	43 10.2	140	18 01.5	−115
11	197 02.5	30 50.7	37.8	33 13.8	26.4	190 29.0	05.2	8 21.6	22.9	57 43.2	141	17 50.0	−115
12	212 05.0	45 51.2	+ 4 37.3	48 14.8	+ 8 25.8	205 31.7	+ 1 05.0	23 23.8	− 1 23.1	72 16.3	141	+17 38.5	−116
13	227 07.4	60 51.7	36.9	63 15.9	25.3	220 34.5	04.9	38 26.0	23.2	86 49.4	142	17 26.9	−117
14	242 09.9	75 52.2	36.5	78 16.9	24.7	235 37.2	04.8	53 28.2	23.3	101 22.5	142	17 15.2	−118
15	257 12.4	90 52.7	·· 36.0	93 18.0	·· 24.1	250 39.9	·· 04.7	68 30.4	·· 23.4	115 55.7	142	·17 03.4	−119
16	272 14.8	105 53.2	35.6	108 19.0	23.6	265 42.6	04.6	83 32.6	23.5	130 28.9	142	16 51.5	−119
17	287 17.3	120 53.7	35.1	123 20.1	23.0	280 45.3	04.5	98 34.8	23.6	145 02.1	143	16 39.6	−120
18	302 19.7	135 54.2	+ 4 34.7	138 21.1	+ 8 22.5	295 48.1	+ 1 04.4	113 37.0	− 1 23.7	159 35.4	143	+16 27.6	−121
19	317 22.2	150 54.7	34.3	153 22.2	21.9	310 50.8	04.3	128 39.1	23.8	174 08.7	144	16 15.5	−122
20	332 24.7	165 55.2	33.8	168 23.2	21.3	325 53.5	04.2	143 41.3	23.9	188 42.1	144	16 03.3	−123
21	347 27.1	180 55.7	·· 33.4	183 24.3	·· 20.8	340 56.2	·· 04.1	158 43.5	·· 24.1	203 15.5	144	·15 51.0	−123
22	2 29.6	195 56.2	32.9	198 25.4	20.2	355 58.9	04.0	173 45.7	24.2	217 48.9	145	15 38.7	−124
23	17 32.1	210 56.7	32.5	213 26.4	19.6	11 01.7	03.9	188 47.9	24.3	232 22.4	145	15 26.3	−125
24	32 34.5	225 57.2	+ 4 32.0	228 27.5	+ 8 19.1	26 04.4	+ 1 03.8	203 50.1	− 1 24.4	246 55.9	145	+15 13.8	−125
code	—	+ 5	− 5	+ 11	− 5	+ 28	− 1	+ 22	− 1				

GCT h	SUN GHA ° ′	Dec. ° ′
0	183 49.7	−10 41.2
1	198 49.8	42.1
2	213 49.9	43.0
3	228 50.0	•• 43.8
4	243 50.1	44.7
5	258 50.2	45.6
6	273 50.3	−10 46.5
7	288 50.4	47.4
8	303 50.5	48.3
9	318 50.6	•• 49.2
10	333 50.7	50.1
11	348 50.8	51.0
12	3 50.9	−10 51.8
13	18 51.0	52.7
14	33 51.1	53.6
15	48 51.2	•• 54.5
16	63 51.3	55.4
17	78 51.4	56.3
18	93 51.5	−10 57.2
19	108 51.6	58.1
20	123 51.7	58.9
21	138 51.8	•10 59.8
22	153 51.9	11 00.7
23	168 52.0	01.6
0	183 52.1	−11 02.5
1	198 52.2	03.4
2	213 52.3	04.3
3	228 52.4	•• 05.1
4	243 52.4	06.0
5	258 52.5	06.9
6	273 52.6	−11 07.8
7	288 52.7	08.7
8	303 52.8	09.5
9	318 52.9	•• 10.4
10	333 53.0	11.3
11	348 53.1	12.2
12	3 53.2	−11 13.1
13	18 53.3	14.0
14	33 53.4	14.8
15	48 53.4	•• 15.7
16	63 53.5	16.6
17	78 53.6	17.5
18	93 53.7	−11 18.4
19	108 53.8	19.2
20	123 53.9	20.1
21	138 54.0	•• 21.0
22	153 54.1	21.9
23	168 54.1	22.7
0	183 54.2	−11 23.6
1	198 54.3	24.5
2	213 54.4	25.4
3	228 54.5	•• 26.3
4	243 54.6	27.1
5	258 54.7	28.0
6	273 54.8	−11 28.9
7	288 54.8	29.8
8	303 54.9	30.6
9	318 55.0	•• 31.5
10	333 55.1	32.4
11	348 55.2	33.3
12	3 55.2	−11 34.1
13	18 55.3	35.0
14	33 55.4	35.9
15	48 55.5	•• 36.8
16	63 55.6	37.6
17	78 55.7	38.5
18	93 55.7	−11 39.4
19	108 55.8	40.2
20	123 55.9	41.1
21	138 56.0	•• 42.0
22	153 56.1	42.9
23	168 56.1	43.7
24	183 56.2	−11 44.6
code	—	− 9

STARS No.	SHA ° ′	Dec. ° ′	Transit Mer. Gr. h m
1	358 31.3	+28 49.7	22 00
2	358 20.7	+58 53.3	22 01
3	349 42.0	−18 14.9	22 35
4	339 19.9	+59 59.3	23 16
5	336 00.3	−57 28.7	23 30
6	332 17.5	+89 02.4	23 45
7	328 52.9	+23 14.3	0 02
8	315 52.9	−40 29.5	0 54
9	309 46.5	+49 41.6	1 18
10	291 42.4	+16 25.0	2 30
11	281 56.4	− 8 15.0	3 09
12	281 42.7	+45 57.1	3 10
13	279 21.5	+ 6 18.7	3 20
14	279 11.0	+28 34.3	3 20
15	276 33.2	− 1 13.6	3 31
16	271 51.3	+ 7 24.2	3 50
17	264 16.5	−52 39.7	4 20
18	259 14.5	−16 38.6	4 40
19	255 48.9	−28 53.9	4 54
20	245 48.2	+ 5 21.2	5 33
21	244 24.3	+28 08.7	5 39
22	234 37.3	−59 20.8	6 18
23	223 26.8	−43 13.9	7 03
24	221 50.3	−69 30.7	7 09
25	218 41.8	− 8 26.7	7 22
26	208 32.9	+12 12.3	8 02
27	194 48.6	+62 00.5	8 57
28	183 21.1	+14 50.5	9 43
29	174 02.2	−62 49.8	10 20
30	172 53.5	−56 50.5	10 24
31	168 47.4	−59 25.4	10 41
32	167 01.6	+56 13.2	10 48
33	159 30.5	+55 10.5	11 18
34	159 20.5	−10 54.6	11 18
35	153 35.6	+49 33.2	11 41
36	149 02.8	−36 08.0	11 59
37	146 38.3	+19 26.0	12 09
38	140 56.1	−60 38.4	12 32
39	137 18.5	+74 21.1	12 46
40	126 50.5	+26 52.6	13 28
41	120 38.1	−22 29.3	13 53
42	113 23.5	−26 19.7	14 22
43	109 07.5	−68 56.8	14 39
44	103 06.0	−15 40.1	15 03
45	97 25.2	−37 04.4	15 25
46	96 49.7	+12 35.6	15 28
47	91 08.0	+51 29.8	15 50
48	84 45.5	−34 24.8	16 16
49	81 10.5	+38 44.4	16 30
50	76 55.8	−26 21.7	16 47
51	62 53.5	+ 8 44.4	17 43
52	54 32.0	−56 53.8	18 16
53	50 03.2	+45 06.7	18 34
54	34 32.5	+ 9 39.3	19 36
55	28 41.5	−47 11.9	20 00
56	16 14.7	−29 52.7	20 49
57	14 24.4	+14 56.9	20 57

Lat.	Sunrise h m	Twlt. begins h m	Moonrise 22 h m	23 h m	24 h m	25 h m
N °						
70	7 45	4 12	□	□	22 11	24 23
68	7 31	4 19	□	20 14	22 38	24 35
66	7 21	4 24	□	20 59	22 58	24 46
64	7 12	4 29	19 29	21 29	23 15	24 55
62	7 04	4 32	20 09	21 51	23 28	25 02
60	6 57	4 36	20 36	22 09	23 40	25 09
58	6 52	4 38	20 58	22 23	23 49	25 14
56	6 46	4 40	21 15	22 36	23 58	25 19
54	6 42	4 42	21 30	22 47	24 05	0 05
52	6 37	4 43	21 42	22 57	24 12	0 12
50	6 34	4 44	21 53	23 05	24 18	0 18
45	6 25	4 46	22 17	23 24	24 31	0 31
40	6 18	4 47	22 35	23 38	24 42	0 42
35	6 12	4 47	22 51	23 51	24 51	0 51
30	6 07	4 46	23 04	24 02	0 02	0 59
20	5 57	4 43	23 27	24 20	0 20	1 13
10	5 49	4 38	23 47	24 36	0 36	1 24
0	5 41	4 31	24 05	0 05	0 51	1 36
10	5 33	4 21	24 23	0 23	1 06	1 47
20	5 24	4 09	24 43	0 43	1 22	1 58
30	5 14	3 51	0 25	1 05	1 40	2 12
35	5 08	3 40	0 40	1 18	1 51	2 19
40	5 02	3 25	0 58	1 33	2 03	2 28
45	4 54	3 06	1 19	1 51	2 17	2 38
50	4 44	2 40	1 45	2 13	2 34	2 51
52	4 40	2 27	1 58	2 23	2 42	2 56
54	4 35	2 12	2 13	2 35	2 51	3 02
56	4 30	1 51	2 30	2 49	3 01	3 09
58	4 24	1 25	2 51	3 04	3 12	3 17
60	4 17	0 43	3 17	3 23	3 25	3 26
S						

Lat.	Sunset h m	Twlt. ends h m	Moonset 22 h m	23 h m	24 h m	25 h m
N °						
70	15 43	19 11	□	□	16 59	16 18
68	15 56	19 05	□	17 21	16 30	16 03
66	16 07	19 00	□	16 34	16 08	15 51
64	16 16	18 56	16 27	16 04	15 51	15 40
62	16 24	18 53	15 46	15 41	15 36	15 32
60	16 30	18 50	15 18	15 22	15 24	15 24
58	16 36	18 48	14 56	15 07	15 13	15 17
56	16 42	18 46	14 38	14 53	15 04	15 11
54	16 46	18 44	14 23	14 42	14 55	15 06
52	16 51	18 44	14 10	14 32	14 48	15 01
50	16 55	18 43	13 59	14 23	14 41	14 56
45	17 03	18 41	13 34	14 03	14 27	14 47
40	17 10	18 40	13 15	13 47	14 15	14 39
35	17 16	18 41	12 59	13 34	14 04	14 32
30	17 22	18 42	12 45	13 22	13 55	14 26
20	17 31	18 45	12 21	13 02	13 40	14 15
10	17 40	18 51	12 00	12 44	13 26	14 05
0	17 48	18 58	11 40	12 27	13 13	13 56
10	17 56	19 08	11 20	12 11	13 00	13 47
20	18 05	19 21	10 59	11 53	12 45	13 38
30	18 15	19 39	10 35	11 32	12 29	13 26
35	18 21	19 51	10 20	11 20	12 20	13 20
40	18 28	20 07	10 03	11 05	12 09	13 12
45	18 36	20 26	9 43	10 49	11 56	13 04
50	18 45	20 52	9 17	10 28	11 40	12 53
52	18 50	21 06	9 04	10 18	11 33	12 48
54	18 55	21 23	8 50	10 06	11 24	12 43
56	19 00	21 43	8 33	9 53	11 15	12 37
58	19 06	22 11	8 13	9 38	11 05	12 30
60	19 13	23 00	7 47	9 20	10 52	12 22
S						

GCT h	Equation of Time (App.—Mean) 22 m s	23 m s	24 m s
0	+15 18.8	+15 28.1	+15 36.8
6	+15 21.2	+15 30.3	+15 38.8
12	+15 23.5	+15 32.5	+15 40.8
18	+15 25.8	+15 34.7	+15 42.8
24	+15 28.1	+15 36.8	+15 44.7

GCT of Transit Meridian of Greenwich

DAY	Moon h m	Venus h m	Mars h m	Jupiter h m	Saturn h m
22	5 28	8 58	8 51	22 25	10 34
23	6 16	8 58	8 49	22 20	10 30
24	7 02	8 57	8 47	22 16	10 27
25	7 46	8 56	8 46	22 12	10 23

ADDITIONAL ALTITUDE CORRECTIONS

Alt. °	Sun's Low'r Limb ′	Venus ′	Mars ′
0			
30	0.4	0.3	0.1
45	0.4	0.2	0.1
60	0.4	0.2	0.0
75	0.4	0.1	0.0
90	0.4	0.0	0.0

Moon's Lower Limb
Add

Alt. °	22 ′	23 ′	24 ′
0			
4	12.1	12.4	12.9
8	12.1	12.4	12.9
12	12.2	12.4	12.9
16	12.2	12.4	12.9
20	12.2	12.5	13.0
24	12.3	12.6	13.0
28	12.4	12.6	13.1
32	12.5	12.7	13.2
36	12.6	12.8	13.2
40	12.7	12.9	13.3
44	12.8	13.0	13.4
48	12.9	13.1	13.5
52	13.1	13.3	13.6
56	13.2	13.4	13.7
60	13.4	13.5	13.9
64	13.5	13.7	14.0
68	13.7	13.9	14.1
72	13.9	14.0	14.3
76	14.1	14.2	14.4
80	14.3	14.4	14.5
84	14.4	14.5	14.7
88	14.6	14.7	14.8
90	14.8	14.8	14.9

Add to table, back cover

Moon's Upper Limb
Subtract

Alt. °	22 ′	23 ′	24 ′
0			
4	17.5	17.4	17.1
8	17.5	17.4	17.1
12	17.5	17.3	17.0
16	17.4	17.3	17.0
20	17.4	17.2	17.0
24	17.3	17.2	16.9
28	17.2	17.1	16.9
32	17.2	17.0	16.8
36	17.1	16.9	16.7
40	16.9	16.8	16.6
44	16.8	16.7	16.5
48	16.7	16.6	16.4
52	16.6	16.5	16.3
56	16.4	16.3	16.2
60	16.2	16.2	16.1
64	16.1	16.0	16.0
68	15.9	15.9	15.8
72	15.7	15.7	15.7
76	15.6	15.6	15.6
80	15.4	15.4	15.4
84	15.2	15.2	15.3
88	15.0	15.0	15.1
90	14.9	14.9	15.0

Subtract from table, back cover

Last Quarter 22

GCT	♈ GHA	VENUS −4.2 GHA	VENUS Dec.	MARS 1.8 GHA	MARS Dec.	JUPITER −2.4 GHA	JUPITER Dec.	SATURN 1.1 GHA	SATURN Dec.	MOON GHA	code	MOON Dec.	code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
0	32 34.5	225 57.2	+ 4 32.0	228 27.5	+ 8 19.1	26 04.4	+ 1 03.8	203 50.1	− 1 24.4	246 55.9	145	+15 13.8	−125
1	47 37.0	240 57.7	31.6	243 28.5	18.5	41 07.1	03.7	218 52.3	24.5	261 29.4	145	15 01.3	−126
2	62 39.5	255 58.2	31.1	258 29.6	18.0	56 09.8	03.6	233 54.5	24.6	276 02.9	146	14 48.7	−127
3	77 41.9	270 58.7	•• 30.7	273 30.6	•• 17.4	71 12.5	•• 03.5	248 56.7	•• 24.7	290 36.5	146	· 14 36.0	−128
4	92 44.4	285 59.1	30.2	288 31.7	16.8	86 15.3	03.4	263 58.9	24.8	305 10.1	147	14 23.2	−128
5	107 46.9	300 59.6	29.8	303 32.7	16.3	101 18.0	03.3	279 01.1	25.0	319 43.8	146	14 10.4	−129
6	122 49.3	316 00.1	+ 4 29.3	318 33.8	+ 8 15.7	116 20.7	+ 1 03.2	294 03.3	− 1 25.1	334 17.4	147	+13 57.5	−130
7	137 51.8	331 00.6	28.9	333 34.8	15.1	131 23.4	03.1	309 05.5	25.2	348 51.1	148	13 44.5	−130
8	152 54.2	346 01.1	28.4	348 35.9	14.6	146 26.1	03.0	324 07.6	25.3	3 24.9	147	13 31.5	−131
9	167 56.7	1 01.6	•• 28.0	3 36.9	•• 14.0	161 28.9	•• 02.9	339 09.8	•• 25.4	17 58.6	148	· 13 18.4	−132
10	182 59.2	16 02.0	27.5	18 38.0	13.5	176 31.6	02.8	354 12.0	25.5	32 32.4	148	13 05.2	−132
11	198 01.6	31 02.5	27.1	33 39.0	12.9	191 34.3	02.7	9 14.2	25.6	47 06.2	148	12 52.0	−133
12	213 04.1	46 03.0	+ 4 26.6	48 40.1	+ 8 12.3	206 37.0	+ 1 02.6	24 16.4	− 1 25.7	61 40.0	148	+12 38.7	−134
13	228 06.6	61 03.5	26.2	63 41.2	11.8	221 39.7	02.5	39 18.6	25.8	76 13.8	149	12 25.3	−134
14	243 09.0	76 03.9	25.7	78 42.2	11.2	236 42.4	02.4	54 20.8	26.0	90 47.7	148	12 11.9	−135
15	258 11.5	91 04.4	•• 25.2	93 43.3	•• 10.6	251 45.2	•• 02.3	69 23.0	•• 26.1	105 21.5	149	· 11 58.4	−136
16	273 14.0	106 04.9	24.8	108 44.3	10.1	266 47.9	02.2	84 25.2	26.2	119 55.4	149	11 44.8	−136
17	288 16.4	121 05.4	24.3	123 45.4	09.5	281 50.6	02.1	99 27.4	26.3	134 29.3	150	11 31.2	−137
18	303 18.9	136 05.8	+ 4 23.8	138 46.4	+ 8 08.9	296 53.3	+ 1 02.0	114 29.6	− 1 26.4	149 03.3	149	+11 17.5	−137
19	318 21.3	151 06.3	23.4	153 47.5	08.4	311 56.0	01.9	129 31.8	26.5	163 37.2	150	11 03.8	−138
20	333 23.8	166 06.8	22.9	168 48.5	07.8	326 58.7	01.8	144 34.0	26.6	178 11.2	149	10 50.0	−138
21	348 26.3	181 07.2	•• 22.5	183 49.6	•• 07.3	342 01.5	•• 01.7	159 36.1	•• 26.7	192 45.1	150	· 10 36.2	−140
22	3 28.7	196 07.7	22.0	198 50.7	06.7	357 04.2	01.6	174 38.3	26.8	207 19.1	150	10 22.2	−139
23	18 31.2	211 08.2	21.5	213 51.7	06.1	12 06.9	01.5	189 40.5	27.0	221 53.1	150	10 08.3	−140
0	33 33.7	226 08.6	+ 4 21.0	228 52.8	+ 8 05.6	27 09.6	+ 1 01.4	204 42.7	− 1 27.1	236 27.1	150	+ 9 54.3	−141
1	48 36.1	241 09.1	20.6	243 53.8	05.0	42 12.3	01.3	219 44.9	27.2	251 01.1	150	9 40.2	−141
2	63 38.6	256 09.6	20.1	258 54.9	04.4	57 15.0	01.2	234 47.1	27.3	265 35.1	151	9 26.1	−142
3	78 41.1	271 10.0	•• 19.6	273 55.9	•• 03.9	72 17.8	•• 01.1	249 49.3	•• 27.4	280 09.2	150	· 9 11.9	−143
4	93 43.5	286 10.5	19.2	288 57.0	03.3	87 20.5	01.0	264 51.5	27.5	294 43.2	150	8 57.6	−143
5	108 46.0	301 10.9	18.7	303 58.1	02.7	102 23.2	00.9	279 53.7	27.6	309 17.2	151	8 43.3	−143
6	123 48.5	316 11.4	+ 4 18.2	318 59.1	+ 8 02.2	117 25.9	+ 1 00.8	294 55.9	− 1 27.7	323 51.3	150	+ 8 29.0	−144
7	138 50.9	331 11.8	17.7	334 00.2	01.6	132 28.6	00.7	309 58.1	27.8	338 25.3	151	8 14.6	−144
8	153 53.4	346 12.3	17.3	349 01.2	01.1	147 31.3	00.6	325 00.3	28.0	352 59.4	150	8 00.2	−145
9	168 55.8	1 12.7	•• 16.8	4 02.3	· 8 00.5	162 34.0	•• 00.5	340 02.5	•• 28.1	7 33.4	151	· 7 45.7	−145
10	183 58.3	16 13.2	16.3	19 03.3	7 59.9	177 36.8	00.4	355 04.7	28.2	22 07.5	150	7 31.2	−146
11	199 00.8	31 13.6	15.8	34 04.4	59.4	192 39.5	00.3	10 06.9	28.3	36 41.5	151	7 16.6	−147
12	214 03.2	46 14.1	+ 4 15.3	49 05.5	+ 7 58.8	207 42.2	+ 1 00.2	25 09.0	− 1 28.4	51 15.6	150	+ 7 01.9	−146
13	229 05.7	61 14.5	14.9	64 06.5	58.2	222 44.9	00.1	40 11.2	28.5	65 49.6	151	6 47.3	−147
14	244 08.2	76 15.0	14.4	79 07.6	57.7	237 47.6	1 00.0	55 13.4	28.6	80 23.7	150	6 32.6	−148
15	259 10.6	91 15.4	•• 13.9	94 08.6	•• 57.1	252 50.3	· 0 59.9	70 15.6	•• 28.7	94 57.7	151	· 6 17.8	−148
16	274 13.1	106 15.9	13.4	109 09.7	56.5	267 53.0	59.8	85 17.8	28.8	109 31.8	150	6 03.0	−149
17	289 15.6	121 16.3	12.9	124 10.7	56.0	282 55.7	59.7	100 20.0	28.9	124 05.8	150	5 48.1	−148
18	304 18.0	136 16.8	+ 4 12.4	139 11.8	+ 7 55.4	297 58.5	+ 0 59.6	115 22.2	− 1 29.1	138 39.8	150	+ 5 33.3	−150
19	319 20.5	151 17.2	12.0	154 12.9	54.8	313 01.2	59.5	130 24.4	29.2	153 13.8	150	5 18.3	−149
20	334 22.9	166 17.6	11.5	169 13.9	54.3	328 03.9	59.4	145 26.6	29.3	167 47.8	150	5 03.4	−150
21	349 25.4	181 18.1	•• 11.0	184 15.0	•• 53.7	343 06.6	•• 59.3	160 28.8	•• 29.4	182 21.8	149	· 4 48.4	−151
22	4 27.9	196 18.5	10.5	199 16.0	53.2	358 09.3	59.2	175 31.0	29.5	196 55.7	150	4 33.3	−151
23	19 30.3	211 19.0	10.0	214 17.1	52.6	13 12.0	59.1	190 33.2	29.6	211 29.7	149	4 18.2	−151
0	34 32.8	226 19.4	+ 4 09.5	229 18.2	+ 7 52.0	28 14.7	+ 0 59.0	205 35.4	− 1 29.7	226 03.6	149	+ 4 03.1	−151
1	49 35.3	241 19.8	09.0	244 19.2	51.5	43 17.4	58.9	220 37.6	29.8	240 37.5	149	3 48.0	−152
2	64 37.7	256 20.3	08.5	259 20.3	50.9	58 20.1	58.8	235 39.8	29.9	255 11.4	149	3 32.8	−152
3	79 40.2	271 20.7	•• 08.0	274 21.3	•• 50.3	73 22.8	•• 58.7	250 42.0	•• 30.1	269 45.3	149	· 3 17.6	−153
4	94 42.7	286 21.1	07.5	289 22.4	49.8	88 25.6	58.6	265 44.2	30.2	284 19.2	148	3 02.3	−153
5	109 45.1	301 21.5	07.0	304 23.5	49.2	103 28.3	58.5	280 46.3	30.3	298 53.0	148	2 47.0	−153
6	124 47.6	316 22.0	+ 4 06.5	319 24.5	+ 7 48.6	118 31.0	+ 0 58.4	295 48.5	− 1 30.4	313 26.8	148	+ 2 31.7	−153
7	139 50.1	331 22.4	06.0	334 25.6	48.1	133 33.7	58.3	310 50.7	30.5	328 00.6	148	2 16.4	−154
8	154 52.5	346 22.8	05.5	349 26.6	47.5	148 36.4	58.2	325 52.9	30.6	342 34.4	148	2 01.0	−154
9	169 55.0	1 23.2	•• 05.0	4 27.7	•• 46.9	163 39.1	•• 58.1	340 55.1	•• 30.7	357 08.2	147	· 1 45.6	−154
10	184 57.4	16 23.7	04.5	19 28.8	46.4	178 41.8	58.0	355 57.3	30.8	11 41.9	147	1 30.2	−154
11	199 59.9	31 24.1	04.0	34 29.8	45.8	193 44.5	57.9	10 59.5	30.9	26 15.6	146	1 14.8	−155
12	215 02.4	46 24.5	+ 4 03.5	49 30.9	+ 7 45.2	208 47.2	+ 0 57.8	26 01.7	− 1 31.0	40 49.2	146	+ 0 59.3	−155
13	230 04.8	61 24.9	03.0	64 31.9	44.7	223 49.9	57.7	41 03.9	31.2	55 22.8	146	0 43.8	−155
14	245 07.3	76 25.3	02.5	79 33.0	44.1	238 52.6	57.6	56 06.1	31.3	69 56.4	146	0 28.3	−155
15	260 09.8	91 25.8	•• 02.0	94 34.1	•• 43.5	253 55.3	•• 57.5	71 08.3	•• 31.4	84 30.0	145	+ 0 12.8	−156
16	275 12.2	106 26.2	01.5	109 35.1	43.0	268 58.1	57.4	86 10.5	31.5	99 03.5	145	− 0 02.8	−156
17	290 14.7	121 26.6	01.0	124 36.2	42.4	284 00.8	57.3	101 12.7	31.6	113 37.0	145	0 18.4	−155
18	305 17.2	136 27.0	+ 4 00.5	139 37.3	+ 7 41.9	299 03.5	+ 0 57.2	116 14.9	− 1 31.7	128 10.5	144	− 0 33.9	−157
19	320 19.6	151 27.4	4 00.0	154 38.3	41.3	314 06.2	57.1	131 17.1	31.8	142 43.9	144	0 49.6	−156
20	335 22.1	166 27.8	3 59.5	169 39.4	40.7	329 08.9	57.0	146 19.3	31.9	157 17.3	143	1 05.2	−156
21	350 24.6	181 28.2	•• 58.9	184 40.4	•• 40.2	344 11.6	•• 56.9	161 21.5	•• 32.0	171 50.6	143	· 1 20.8	−157
22	5 27.0	196 28.7	58.4	199 41.5	39.6	359 14.3	56.8	176 23.7	32.1	186 23.9	142	1 36.5	−156
23	20 29.5	211 29.1	57.9	214 42.6	39.0	14 17.0	56.8	191 25.9	32.3	200 57.1	142	1 52.1	−157
24	35 31.9	226 29.5	+ 3 57.4	229 43.6	+ 7 38.5	29 19.7	+ 0 56.7	206 28.1	− 1 32.4	215 30.3	142	− 2 07.8	−157
code	−	+ 4	− 4	+ 10	− 6	+ 27	− 1	+ 22	− 1				

GCT	SUN GHA	SUN Dec.
h	° ′	° ′
0	183 56.2	−11 44.6
1	198 56.3	45.5
2	213 56.4	46.3
3	228 56.5	•• 47.2
4	243 56.5	48.1
5	258 56.6	49.0
6	273 56.7	−11 49.8
7	288 56.8	50.7
8	303 56.8	51.6
9	318 56.9	•• 52.4
10	333 57.0	53.3
11	348 57.1	54.2
12	3 57.1	−11 55.0
13	18 57.2	55.9
14	33 57.3	56.8
15	48 57.4	•• 57.6
16	63 57.4	58.5
17	78 57.5	11 59.4
18	93 57.6	−12 00.2
19	108 57.7	01.1
20	123 57.7	01.9
21	138 57.8	•• 02.8
22	153 57.9	03.7
23	168 58.0	04.5
0	183 58.0	−12 05.4
1	198 58.1	06.3
2	213 58.2	07.1
3	228 58.2	•• 08.0
4	243 58.3	08.9
5	258 58.4	09.7
6	273 58.5	−12 10.6
7	288 58.5	11.4
8	303 58.6	12.3
9	318 58.7	•• 13.2
10	333 58.7	14.0
11	348 58.8	14.9
12	3 58.9	−12 15.7
13	18 58.9	16.6
14	33 59.0	17.5
15	48 59.1	•• 18.3
16	63 59.1	19.2
17	78 59.2	20.0
18	93 59.3	−12 20.9
19	108 59.3	21.7
20	123 59.4	22.6
21	138 59.5	•• 23.5
22	153 59.5	24.3
23	168 59.6	25.2
0	183 59.6	−12 26.0
1	198 59.7	26.9
2	213 59.8	27.7
3	228 59.8	•• 28.6
4	243 59.9	29.4
5	259 00.0	30.3
6	274 00.0	−12 31.1
7	289 00.1	32.0
8	304 00.2	32.8
9	319 00.2	•• 33.7
10	334 00.3	34.6
11	349 00.3	35.4
12	4 00.4	−12 36.3
13	19 00.4	37.1
14	34 00.5	38.0
15	49 00.6	•• 38.8
16	64 00.6	39.7
17	79 00.7	40.5
18	94 00.7	−12 41.4
19	109 00.8	42.2
20	124 00.9	43.1
21	139 00.9	•• 43.9
22	154 01.0	44.7
23	169 01.0	45.6
24	184 01.1	−12 46.4
code	—	− 9

No.	STARS SHA	Dec.	Transit Mer. Gr.
	° ′	° ′	h m
1	358 31.3	+28 49.7	21 48
2	358 20.7	+58 53.3	21 49
3	349 42.0	−18 14.9	22 23
4	339 19.8	+59 59.3	23 05
5	336 00.3	−57 28.8	23 18
6	332 17.4	+89 02.4	23 33
7	328 52.8	+23 14.4	23 46
8	315 52.9	−40 29.6	0 42
9	309 46.5	+49 41.6	1 06
10	291 42.4	+16 25.0	2 19
11	281 56.4	− 8 15.1	2 58
12	281 42.7	+45 57.1	2 58
13	279 21.5	+ 6 18.7	3 08
14	279 11.0	+28 34.3	3 09
15	276 33.2	− 1 13.6	3 19
16	271 51.3	+ 7 24.2	3 38
17	264 16.5	−52 39.7	4 08
18	259 14.4	−16 38.6	4 28
19	255 48.9	−28 53.9	4 42
20	245 48.2	+ 5 21.2	5 22
21	244 24.3	+28 08.7	5 27
22	234 37.2	−59 20.8	6 06
23	223 26.8	−43 13.9	6 51
24	221 50.3	−69 30.7	6 57
25	218 41.7	− 8 26.7	7 10
26	208 32.9	+12 12.3	7 50
27	194 48.5	+62 00.5	8 45
28	183 21.1	+14 50.5	9 31
29	174 02.2	−62 49.8	10 08
30	172 53.5	−56 50.5	10 13
31	168 47.4	−59 25.4	10 29
32	167 01.5	+56 13.2	10 36
33	159 30.5	+55 10.5	11 06
34	159 20.5	−10 54.6	11 07
35	153 35.6	+49 33.1	11 29
36	149 02.8	−36 08.0	11 48
37	146 38.3	+19 26.0	11 57
38	140 56.1	−60 38.4	12 20
39	137 18.5	+74 21.1	12 34
40	126 50.5	+26 52.6	13 16
41	120 38.1	−22 29.3	13 41
42	113 23.5	−26 19.7	14 10
43	109 07.5	−68 56.8	14 27
44	103 06.0	−15 40.1	14 51
45	97 25.2	−37 04.4	15 14
46	96 49.7	+12 35.6	15 16
47	91 08.0	+51 29.8	15 39
48	84 45.5	−34 24.8	16 04
49	81 10.6	+38 44.4	16 18
50	76 55.8	−26 21.7	16 35
51	62 53.5	+ 8 44.4	17 31
52	54 32.0	−56 53.8	18 05
53	50 03.2	+45 06.7	18 23
54	34 32.5	+ 9 39.3	19 24
55	28 41.5	−47 11.9	19 48
56	16 14.7	−29 52.7	20 37
57	14 24.4	+14 56.9	20 45

Lat.	Sunrise	Twlt. begins	Moonrise 25	26	27	28
N °	h m	h m	h m	h m	h m	h m
70	7 58	4 24	24 23	0 23	2 23	4 24
68	7 43	4 29	24 35	0 35	2 27	4 20
66	7 31	4 34	24 46	0 46	2 31	4 16
64	7 21	4 37	24 55	0 55	2 33	4 13
62	7 12	4 40	25 02	1 02	2 36	4 11
60	7 05	4 42	25 09	1 09	2 38	4 09
58	6 58	4 44	25 14	1 14	2 40	4 07
56	6 53	4 46	25 19	1 19	2 41	4 05
54	6 47	4 47	0 05	1 24	2 43	4 04
52	6 43	4 48	0 12	1 28	2 44	4 02
50	6 38	4 49	0 18	1 31	2 45	4 01
45	6 29	4 50	0 31	1 39	2 48	3 59
40	6 21	4 49	0 42	1 46	2 50	3 56
35	6 15	4 49	0 51	1 51	2 52	3 55
30	6 09	4 48	0 59	1 56	2 54	3 53
20	5 59	4 44	1 13	2 04	2 57	3 50
10	5 49	4 38	1 24	2 12	2 59	3 48
0	5 41	4 31	1 36	2 19	3 02	3 45
10	5 32	4 20	1 47	2 26	3 04	3 43
20	5 22	4 07	1 58	2 33	3 06	3 41
30	5 11	3 47	2 12	2 41	3 09	3 38
35	5 05	3 35	2 19	2 46	3 11	3 37
40	4 58	3 20	2 28	2 51	3 13	3 35
45	4 49	3 00	2 38	2 57	3 15	3 33
50	4 39	2 32	2 51	3 05	3 18	3 31
52	4 34	2 17	2 56	3 08	3 19	3 30
54	4 29	2 00	3 02	3 12	3 20	3 28
56	4 23	1 37	3 09	3 16	3 22	3 27
58	4 16	1 06	3 17	3 20	3 23	3 26
60	4 09	////	3 26	3 25	3 25	3 24
S						

Lat.	Sunset	Twlt. ends	Moonset 25	26	27	28
N °	h m	h m	h m	h m	h m	h m
70	15 28	18 59	16 18	15 48	15 23	14 56
68	15 43	18 54	16 03	15 42	15 23	15 03
66	15 56	18 50	15 51	15 36	15 22	15 09
64	16 06	18 47	15 40	15 31	15 23	15 14
62	16 15	18 45	15 32	15 27	15 23	15 18
60	16 22	18 42	15 24	15 23	15 23	15 22
58	16 29	18 41	15 17	15 20	15 22	15 25
56	16 35	18 40	15 11	15 17	15 22	15 28
54	16 40	18 39	15 06	15 14	15 22	15 31
52	16 45	18 38	15 01	15 12	15 22	15 33
50	16 49	18 37	14 56	15 10	15 22	15 36
45	16 58	18 36	14 47	15 05	15 22	15 41
40	17 06	18 37	14 39	15 01	15 22	15 45
35	17 13	18 38	14 32	14 57	15 22	15 48
30	17 19	18 39	14 26	14 54	15 22	15 52
20	17 29	18 43	14 15	14 49	15 22	15 57
10	17 39	18 50	14 05	14 44	15 22	16 02
0	17 47	18 57	13 56	14 39	15 22	16 07
10	17 56	19 08	13 47	14 34	15 22	16 11
20	18 06	19 22	13 38	14 29	15 22	16 16
30	18 17	19 42	13 26	14 24	15 22	16 22
35	18 24	19 55	13 20	14 20	15 22	16 25
40	18 31	20 11	13 12	14 17	15 22	16 29
45	18 40	20 32	13 04	14 12	15 21	16 33
50	18 50	21 00	12 53	14 07	15 21	16 39
52	18 55	21 15	12 48	14 04	15 21	16 41
54	19 01	21 34	12 43	14 01	15 21	16 44
56	19 07	21 58	12 37	13 58	15 21	16 46
58	19 13	22 32	12 30	13 55	15 21	16 50
60	19 21	////	12 22	13 51	15 21	16 53
S						

GCT	Equation of Time (App.—Mean) 25	26	27
h	m s	m s	m s
0	+15 44.7	+15 52.0	+15 58.5
6	+15 46.6	+15 53.7	+16 00.0
12	+15 48.4	+15 55.3	+16 01.5
18	+15 50.2	+15 56.9	+16 02.9
24	+15 52.0	+15 58.5	+16 04.2

GCT of Transit Meridian of Greenwich

DAY	Moon	Venus	Mars	Jupiter	Saturn
	h m	h m	h m	h m	h m
25	7 46	8 56	8 46	22 12	10 23
26	8 29	8 55	8 44	22 07	10 20
27	9 12	8 55	8 42	22 03	10 16
28	9 56	8 54	8 41	21 59	10 13

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb	Venus	Mars
°	′	′	′
0–30	0.4	0.3	0.1
30–45	0.4	0.2	0.1
45–60	0.4	0.2	0.0
60–75	0.4	0.1	0.0
75–90	0.4	0.0	0.0

Moon's Lower Limb
Add

Alt.	25	26	27
°	′	′	′
0–4	13.5	14.4	15.4
4–8	13.5	14.4	15.4
8–12	13.5	14.4	15.4
12–16	13.6	14.4	15.4
16–20	13.6	14.4	15.4
20–24	13.6	14.5	15.4
24–28	13.7	14.5	15.4
28–32	13.7	14.5	15.4
32–36	13.8	14.6	15.4
36–40	13.9	14.6	15.4
40–44	13.9	14.6	15.4
44–48	14.0	14.7	15.5
48–52	14.1	14.7	15.5
52–56	14.2	14.8	15.5
56–60	14.3	14.8	15.5
60–64	14.4	14.9	15.5
64–68	14.5	14.9	15.5
68–72	14.6	15.0	15.5
72–76	14.7	15.1	15.5
76–80	14.8	15.1	15.5
80–84	14.9	15.2	15.5
84–88	15.0	15.2	15.5
88–90	15.1	15.3	15.5

Add to table, back cover

Moon's Upper Limb
Subtract

Alt.	25	26	27
°	′	′	′
0–4	16.7	16.2	15.6
4–8	16.7	16.2	15.6
8–12	16.7	16.2	15.6
12–16	16.7	16.2	15.6
16–20	16.6	16.2	15.6
20–24	16.6	16.1	15.6
24–28	16.6	16.1	15.6
28–32	16.5	16.1	15.6
32–36	16.4	16.1	15.6
36–40	16.4	16.0	15.6
40–44	16.3	16.0	15.6
44–48	16.2	15.9	15.6
48–52	16.1	15.9	15.6
52–56	16.1	15.8	15.6
56–60	16.0	15.8	15.6
60–64	15.9	15.7	15.6
64–68	15.8	15.7	15.6
68–72	15.7	15.6	15.6
72–76	15.6	15.6	15.6
76–80	15.4	15.5	15.5
80–84	15.3	15.4	15.5
84–88	15.2	15.4	15.5
88–90	15.1	15.3	15.5

Subtract from table, back cover

GCT	♈ GHA	VENUS −4.2 GHA	VENUS Dec.	MARS 1.8 GHA	MARS Dec.	JUPITER −2.4 GHA	JUPITER Dec.	SATURN 1.1 GHA	SATURN Dec.	MOON GHA	code	MOON Dec.	code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
0	35 31.9	226 29.5	+ 3 57.4	229 43.6	+ 7 38.5	29 19.7	+ 0 56.7	206 28.1	− 1 32.4	215 30.3	142	− 2 07.8	−157
1	50 34.4	241 29.9	56.9	244 44.7	37.9	44 22.4	56.6	221 30.2	32.5	230 03.5	141	2 23.5	−157
2	65 36.9	256 30.3	56.4	259 45.8	37.3	59 25.1	56.5	236 32.4	32.6	244 36.6	141	2 39.2	−157
3	80 39.3	271 30.7	·· 55.9	274 46.8	·· 36.8	74 27.8	·· 56.4	251 34.6	·· 32.7	259 09.7	140	· 2 54.9	−157
4	95 41.8	286 31.1	55.3	289 47.9	36.2	89 30.5	56.3	266 36.8	32.8	273 42.7	139	3 10.6	−157
5	110 44.3	301 31.5	54.8	304 48.9	35.6	104 33.2	56.2	281 39.0	32.9	288 15.6	140	3 26.3	−157
6	125 46.7	316 31.9	+ 3 54.3	319 50.0	+ 7 35.1	119 35.9	+ 0 56.1	296 41.2	− 1 33.0	302 48.6	138	− 3 42.0	−157
7	140 49.2	331 32.3	53.8	334 51.1	34.5	134 38.6	56.0	311 43.4	33.1	317 21.4	138	3 57.7	−157
8	155 51.7	346 32.7	53.3	349 52.1	33.9	149 41.3	55.9	326 45.6	33.2	331 54.2	138	4 13.4	−157
9	170 54.1	1 33.1	·· 52.7	4 53.2	·· 33.4	164 44.0	·· 55.8	341 47.8	·· 33.4	346 27.0	136	· 4 29.1	−157
10	185 56.6	16 33.5	52.2	19 54.3	32.8	179 46.7	55.7	356 50.0	33.5	0 59.6	137	4 44.8	−157
11	200 59.0	31 33.9	51.7	34 55.3	32.2	194 49.4	55.6	11 52.2	33.6	15 32.3	135	5 00.5	−157
12	216 01.5	46 34.3	+ 3 51.2	49 56.4	+ 7 31.7	209 52.1	+ 0 55.5	26 54.4	− 1 33.7	30 04.8	136	− 5 16.2	−157
13	231 04.0	61 34.7	50.6	64 57.5	31.1	224 54.9	55.4	41 56.6	33.8	44 37.4	134	5 31.9	−157
14	246 06.4	76 35.0	50.1	79 58.5	30.5	239 57.6	55.3	56 58.8	33.9	59 09.8	134	5 47.6	−157
15	261 08.9	91 35.4	·· 49.6	94 59.6	·· 30.0	255 00.3	·· 55.2	72 01.0	·· 34.0	73 42.2	133	· 6 03.3	−157
16	276 11.4	106 35.8	49.1	110 00.6	29.4	270 03.0	55.1	87 03.2	34.1	88 14.5	133	6 19.0	−157
17	291 13.8	121 36.2	48.5	125 01.7	28.8	285 05.7	55.0	102 05.4	34.2	102 46.8	131	6 34.7	−156
18	306 16.3	136 36.6	+ 3 48.0	140 02.8	+ 7 28.3	300 08.4	+ 0 55.0	117 07.6	− 1 34.3	117 18.9	132	− 6 50.3	−157
19	321 18.8	151 37.0	47.5	155 03.8	27.7	315 11.1	54.9	132 09.8	34.4	131 51.1	130	7 06.0	−156
20	336 21.2	166 37.4	46.9	170 04.9	27.1	330 13.8	54.8	147 12.0	34.6	146 23.1	130	7 21.6	−156
21	351 23.7	181 37.8	·· 46.4	185 06.0	·· 26.6	345 16.5	·· 54.7	162 14.2	·· 34.7	160 55.1	129	· 7 37.2	−156
22	6 26.2	196 38.1	45.9	200 07.0	26.0	0 19.2	54.6	177 16.4	34.8	175 27.0	128	7 52.8	−155
23	21 28.6	211 38.5	45.3	215 08.1	25.5	15 21.9	54.5	192 18.6	34.9	189 58.8	128	8 08.3	−156
0	36 31.1	226 38.9	+ 3 44.8	230 09.2	+ 7 24.9	30 24.6	+ 0 54.4	207 20.8	− 1 35.0	204 30.6	126	− 8 23.9	−155
1	51 33.5	241 39.3	44.2	245 10.2	24.3	45 27.3	54.3	222 23.0	35.1	219 02.2	126	8 39.4	−155
2	66 36.0	256 39.7	43.7	260 11.3	23.8	60 30.0	54.2	237 25.1	35.2	233 33.8	126	8 54.9	−155
3	81 38.5	271 40.0	·· 43.2	275 12.4	·· 23.2	75 32.7	·· 54.1	252 27.3	·· 35.3	248 05.4	124	· 9 10.4	−154
4	96 40.9	286 40.4	42.6	290 13.4	22.6	90 35.4	54.0	267 29.5	35.4	262 36.8	124	9 25.8	−155
5	111 43.4	301 40.8	42.1	305 14.5	22.1	105 38.1	53.9	282 31.7	35.5	277 08.2	122	9 41.3	−154
6	126 45.9	316 41.2	+ 3 41.6	320 15.6	+ 7 21.5	120 40.8	+ 0 53.8	297 33.9	− 1 35.6	291 39.4	122	− 9 56.7	−153
7	141 48.3	331 41.5	41.0	335 16.6	20.9	135 43.5	53.7	312 36.1	35.8	306 10.6	121	10 12.0	−154
8	156 50.8	346 41.9	40.5	350 17.7	20.4	150 46.2	53.7	327 38.3	35.9	320 41.7	121	10 27.4	−152
9	171 53.3	1 42.3	·· 39.9	5 18.8	·· 19.8	165 48.9	·· 53.6	342 40.5	·· 36.0	335 12.8	119	·10 42.6	−153
10	186 55.7	16 42.7	39.4	20 19.8	19.2	180 51.5	53.5	357 42.7	36.1	349 43.7	119	10 57.9	−152
11	201 58.2	31 43.0	38.8	35 20.9	18.7	195 54.2	53.4	12 44.9	36.2	4 14.6	117	11 13.1	−152
12	217 00.6	46 43.4	+ 3 38.3	50 22.0	+ 7 18.1	210 56.9	+ 0 53.3	27 47.1	− 1 36.3	18 45.3	117	−11 28.3	−151
13	232 03.1	61 43.8	37.7	65 23.0	17.5	225 59.6	53.2	42 49.3	36.4	33 16.0	116	11 43.4	−151
14	247 05.6	76 44.1	37.2	80 24.1	17.0	241 02.3	53.1	57 51.5	36.5	47 46.6	115	11 58.5	−151
15	262 08.0	91 44.5	·· 36.6	95 25.2	·· 16.4	256 05.0	·· 53.0	72 53.7	·· 36.6	62 17.1	114	·12 13.6	−150
16	277 10.5	106 44.9	36.1	110 26.2	15.8	271 07.7	52.9	87 55.9	36.7	76 47.5	112	12 28.6	−149
17	292 13.0	121 45.2	35.5	125 27.3	15.3	286 10.4	52.8	102 58.1	36.8	91 17.7	113	12 43.5	−149
18	307 15.4	136 45.6	+ 3 35.0	140 28.4	+ 7 14.7	301 13.1	+ 0 52.7	118 00.3	− 1 36.9	105 48.0	111	−12 58.4	−149
19	322 17.9	151 45.9	34.4	155 29.4	14.1	316 15.8	52.6	133 02.5	37.1	120 18.1	110	13 13.3	−148
20	337 20.4	166 46.3	33.9	170 30.5	13.6	331 18.5	52.6	148 04.7	37.2	134 48.1	109	13 28.1	−147
21	352 22.8	181 46.7	·· 33.3	185 31.6	·· 13.0	346 21.2	·· 52.5	163 06.9	·· 37.3	149 18.0	108	·13 42.8	−147
22	7 25.3	196 47.0	32.8	200 32.7	12.4	1 23.9	52.4	178 09.1	37.4	163 47.8	107	13 57.5	−146
23	22 27.8	211 47.4	32.2	215 33.7	11.9	16 26.6	52.3	193 11.3	37.5	178 17.5	106	14 12.1	−146
0	37 30.2	226 47.7	+ 3 31.7	230 34.8	+ 7 11.3	31 29.3	+ 0 52.2	208 13.5	− 1 37.6	192 47.1	105	−14 26.7	−145
1	52 32.7	241 48.1	31.1	245 35.9	10.7	46 32.0	52.1	223 15.7	37.7	207 16.6	104	14 41.2	−144
2	67 35.1	256 48.4	30.5	260 36.9	10.2	61 34.7	52.0	238 17.9	37.8	221 46.0	103	14 55.6	−144
3	82 37.6	271 48.8	·· 30.0	275 38.0	·· 09.6	76 37.4	·· 51.9	253 20.1	·· 37.9	236 15.3	102	·15 10.0	−143
4	97 40.1	286 49.1	29.4	290 39.1	09.0	91 40.1	51.8	268 22.3	38.0	250 44.5	100	15 24.3	−142
5	112 42.5	301 49.5	28.9	305 40.1	08.5	106 42.8	51.7	283 24.5	38.1	265 13.5	100	15 38.5	−142
6	127 45.0	316 49.8	+ 3 28.3	320 41.2	+ 7 07.9	121 45.5	+ 0 51.6	298 26.7	− 1 38.2	279 42.5	99	−15 52.7	−141
7	142 47.5	331 50.2	27.7	335 42.3	07.3	136 48.1	51.6	313 28.9	38.4	294 11.4	97	16 06.8	−140
8	157 49.9	346 50.5	27.2	350 43.4	06.8	151 50.8	51.5	328 31.1	38.5	308 40.1	97	16 20.8	−139
9	172 52.4	1 50.9	·· 26.6	5 44.4	·· 06.2	166 53.5	·· 51.4	343 33.3	·· 38.6	323 08.8	95	·16 34.7	−139
10	187 54.9	16 51.2	26.0	20 45.5	05.6	181 56.2	51.3	358 35.5	38.7	337 37.3	94	16 48.6	−137
11	202 57.3	31 51.6	25.5	35 46.6	05.1	196 58.9	51.2	13 37.7	38.8	352 05.7	93	17 02.3	−137
12	217 59.8	46 51.9	+ 3 24.9	50 47.6	+ 7 04.5	212 01.6	+ 0 51.1	28 39.9	− 1 38.9	6 34.0	92	−17 16.0	−136
13	233 02.2	61 52.3	24.3	65 48.7	03.9	227 04.3	51.0	43 42.1	39.0	21 02.2	91	17 29.6	−135
14	248 04.7	76 52.6	23.8	80 49.8	03.4	242 07.0	50.9	58 44.3	39.1	35 30.3	90	17 43.1	−135
15	263 07.2	91 52.9	·· 23.2	95 50.8	·· 02.8	257 09.7	·· 50.8	73 46.5	·· 39.2	49 58.3	88	·17 56.6	−133
16	278 09.6	106 53.3	22.6	110 51.9	02.2	272 12.4	50.8	88 48.7	39.3	64 26.1	88	18 09.9	−132
17	293 12.1	121 53.6	22.0	125 53.0	01.7	287 15.1	50.7	103 50.9	39.4	78 53.9	86	18 23.1	−132
18	308 14.6	136 54.0	+ 3 21.5	140 54.1	+ 7 01.1	302 17.7	+ 0 50.6	118 53.1	− 1 39.5	93 21.5	85	−18 36.3	−130
19	323 17.0	151 54.3	20.9	155 55.1	00.5	317 20.4	50.5	133 55.3	39.7	107 49.0	84	18 49.3	−130
20	338 19.5	166 54.6	20.3	170 56.2	7 00.0	332 23.1	50.4	148 57.5	39.8	122 16.4	83	19 02.3	−128
21	353 22.0	181 55.0	·· 19.7	185 57.3	· 6 59.4	347 25.8	·· 50.3	163 59.7	·· 39.9	136 43.7	81	·19 15.1	−128
22	8 24.4	196 55.3	19.2	200 58.3	58.8	2 28.5	50.2	179 01.9	40.0	151 10.8	81	19 27.9	−126
23	23 26.9	211 55.6	18.6	215 59.4	58.3	17 31.2	50.1	194 04.1	40.1	165 37.9	79	19 40.5	−125
24	38 29.4	226 56.0	+ 3 18.0	231 00.5	+ 6 57.7	32 33.9	+ 0 50.1	209 06.3	− 1 40.2	180 04.8	78	−19 53.0	−125
code	—	+ 4	− 6	+ 10	− 6	+ 27	− 1	+ 22	− 1				

GCT h	SUN GHA ° ′	SUN Dec. ° ′
0	184 01.1	−12 46.4
1	199 01.1	47.3
2	214 01.2	48.1
3	229 01.3	•• 49.0
4	244 01.3	49.8
5	259 01.4	50.7
6	274 01.4	−12 51.5
7	289 01.5	52.4
8	304 01.5	53.2
9	319 01.6	•• 54.1
10	334 01.6	54.9
11	349 01.7	55.7
12	4 01.7	−12 56.6
13	19 01.8	57.4
14	34 01.8	58.3
15	49 01.9	•• 59.1
16	64 01.9	12 59.9
17	79 02.0	13 00.8
18	94 02.0	−13 01.6
19	109 02.1	02.5
20	124 02.1	03.3
21	139 02.2	•• 04.2
22	154 02.2	05.0
23	169 02.3	05.8
0	184 02.3	−13 06.7
1	199 02.4	07.5
2	214 02.4	08.3
3	229 02.5	•• 09.2
4	244 02.5	10.0
5	259 02.6	10.9
6	274 02.6	−13 11.7
7	289 02.7	12.5
8	304 02.7	13.4
9	319 02.8	•• 14.2
10	334 02.8	15.0
11	349 02.8	15.9
12	4 02.9	−13 16.7
13	19 02.9	17.5
14	34 03.0	18.4
15	49 03.0	•• 19.2
16	64 03.1	20.0
17	79 03.1	20.9
18	94 03.1	−13 21.7
19	109 03.2	22.5
20	124 03.2	23.4
21	139 03.3	•• 24.2
22	154 03.3	25.0
23	169 03.3	25.9
0	184 03.4	−13 26.7
1	199 03.4	27.5
2	214 03.5	28.3
3	229 03.5	•• 29.2
4	244 03.5	30.0
5	259 03.6	30.8
6	274 03.6	−13 31.7
7	289 03.7	32.5
8	304 03.7	33.3
9	319 03.7	•• 34.1
10	334 03.8	35.0
11	349 03.8	35.8
12	4 03.8	−13 36.6
13	19 03.9	37.4
14	34 03.9	38.3
15	49 03.9	•• 39.1
16	64 04.0	39.9
17	79 04.0	40.7
18	94 04.1	−13 41.6
19	109 04.1	42.4
20	124 04.1	43.2
21	139 04.2	•• 44.0
22	154 04.2	44.9
23	169 04.2	45.7
24	184 04.3	−13 46.5
code	—	− 8

STARS No.	SHA ° ′	Dec. ° ′	Transit Mer. Gr. h m
1	358 31.3	+28 49.7	21 36
2	358 20.7	+58 53.3	21 37
3	349 42.0	−18 14.9	22 11
4	339 19.8	+59 59.4	22 53
5	336 00.3	−57 28.8	23 06
6	332 17.3	+89 02.4	23 21
7	328 52.8	+23 14.4	23 35
8	315 52.9	−40 29.6	0 30
9	309 46.4	+49 41.6	0 55
10	291 42.3	+16 25.0	2 07
11	281 56.4	− 8 15.1	2 46
12	281 42.7	+45 57.2	2 47
13	279 21.5	+ 6 18.7	2 56
14	279 11.0	+28 34.3	2 57
15	276 33.2	− 1 13.6	3 07
16	271 51.3	+ 7 24.2	3 26
17	264 16.5	−52 39.7	3 56
18	259 14.4	−16 38.6	4 16
19	255 48.8	−28 53.9	4 30
20	245 48.1	+ 5 21.2	5 10
21	244 24.2	+28 08.7	5 15
22	234 37.2	−59 20.8	5 54
23	223 26.8	−43 13.9	6 39
24	221 50.2	−69 30.7	6 45
25	218 41.7	− 8 26.7	6 58
26	208 32.9	+12 12.3	7 38
27	194 48.5	+62 00.5	8 33
28	183 21.1	+14 50.5	9 19
29	174 02.2	−62 49.8	9 56
30	172 53.4	−56 50.5	10 01
31	168 47.4	−59 25.4	10 17
32	167 01.5	+56 13.1	10 24
33	159 30.5	+55 10.5	10 54
34	159 20.5	−10 54.6	10 55
35	153 35.6	+49 33.1	11 18
36	149 02.8	−36 08.0	11 36
37	146 38.3	+19 25.9	11 45
38	140 56.1	−60 38.4	12 08
39	137 18.5	+74 21.1	12 23
40	126 50.5	+26 52.5	13 04
41	120 38.1	−22 29.3	13 29
42	113 23.5	−26 19.7	13 58
43	109 07.5	−68 56.8	14 15
44	103 06.0	−15 40.1	14 39
45	97 25.2	−37 04.4	15 02
46	96 49.7	+12 35.6	15 04
47	91 08.0	+51 29.8	15 27
48	84 45.5	−34 24.8	15 52
49	81 10.6	+38 44.4	16 07
50	76 55.9	−26 21.7	16 24
51	62 53.5	+ 8 44.4	17 20
52	54 32.0	−56 53.8	17 53
53	50 03.2	+45 06.7	18 11
54	34 32.6	+ 9 39.3	19 13
55	28 41.5	−47 11.9	19 36
56	16 14.7	−29 52.7	20 26
57	14 24.4	+14 56.9	20 33

GCT h	Equation of Time (App.—Mean) 28 m s	29 m s	30 m s
0	+16 04.2	+16 09.2	+16 13.5
6	+16 05.6	+16 10.4	+16 14.4
12	+16 06.8	+16 11.5	+16 15.3
18	+16 08.1	+16 12.5	+16 16.2
24	+16 09.2	+16 13.5	+16 17.0

Lat. N °	Sunrise h m	Twlt. begins h m	Moonrise 28 h m	29 h m	30 h m	31 h m
70	8 12	4 35	4 24	6 33	9 11	■
68	7 55	4 39	4 20	6 20	8 37	■
66	7 42	4 42	4 16	6 08	8 13	10 49
64	7 30	4 45	4 13	5 59	7 54	10 07
62	7 21	4 47	4 11	5 51	7 39	9 39
60	7 13	4 49	4 09	5 44	7 27	9 17
58	7 05	4 50	4 07	5 38	7 16	9 00
56	6 59	4 52	4 05	5 33	7 06	8 45
54	6 53	4 52	4 04	5 28	6 58	8 32
52	6 48	4 52	4 02	5 24	6 51	8 21
50	6 43	4 53	4 01	5 20	6 44	8 11
45	6 33	4 53	3 59	5 12	6 30	7 51
40	6 25	4 53	3 56	5 05	6 18	7 34
35	6 18	4 52	3 55	5 00	6 08	7 21
30	6 11	4 49	3 53	4 55	6 00	7 09
20	6 00	4 45	3 50	4 46	5 45	6 48
10	5 50	4 39	3 48	4 38	5 32	6 31
0	5 40	4 30	3 45	4 31	5 20	6 14
10	5 31	4 19	3 43	4 24	5 09	5 58
20	5 20	4 04	3 41	4 17	4 56	5 41
30	5 09	3 45	3 38	4 08	4 42	5 21
35	5 02	3 31	3 37	4 04	4 34	5 10
40	4 54	3 14	3 35	3 58	4 25	4 57
45	4 44	2 53	3 33	3 52	4 14	4 42
50	4 33	2 23	3 31	3 45	4 01	4 23
52	4 28	2 07	3 30	3 41	3 56	4 14
54	4 22	1 47	3 28	3 38	3 49	4 05
56	4 16	1 21	3 27	3 34	3 42	3 54
58	4 09	0 39	3 26	3 29	3 34	3 41
60	4 00	////	3 24	3 24	3 25	3 27
S						

Lat. N °	Sunset h m	Twlt. ends h m	Moonset 28 h m	29 h m	30 h m	31 h m
70	15 14	18 48	14 56	14 24	13 30	■
68	15 31	18 44	15 03	14 40	14 06	■
66	15 45	18 41	15 09	14 53	14 32	13 51
64	15 56	18 38	15 14	15 04	14 52	14 34
62	16 06	18 37	15 18	15 13	15 08	15 03
60	16 14	18 35	15 22	15 21	15 22	15 25
58	16 21	18 34	15 25	15 29	15 34	15 43
56	16 28	18 34	15 28	15 35	15 44	15 59
54	16 33	18 32	15 31	15 41	15 54	16 12
52	16 39	18 33	15 33	15 46	16 02	16 24
50	16 43	18 32	15 36	15 51	16 09	16 34
45	16 54	18 33	15 41	16 01	16 25	16 56
40	17 02	18 33	15 45	16 09	16 38	17 14
35	17 10	18 35	15 48	16 17	16 50	17 29
30	17 16	18 37	15 52	16 23	16 59	17 42
20	17 28	18 42	15 57	16 35	17 16	18 04
10	17 38	18 49	16 02	16 45	17 31	18 24
0	17 47	18 58	16 07	16 54	17 45	18 42
10	17 57	19 09	16 11	17 04	18 00	19 00
20	18 07	19 24	16 16	17 14	18 15	19 20
30	18 19	19 45	16 22	17 25	18 32	19 42
35	18 26	19 58	16 25	17 32	18 42	19 56
40	18 34	20 15	16 29	17 40	18 54	20 11
45	18 44	20 38	16 33	17 49	19 08	20 30
50	18 55	21 08	16 39	18 00	19 25	20 53
52	19 01	21 25	16 41	18 05	19 33	21 04
54	19 06	21 45	16 44	18 10	19 42	21 17
56	19 13	22 13	16 46	18 17	19 52	21 32
58	19 20	23 00	16 50	18 24	20 04	21 49
60	19 29	////	16 53	18 32	20 17	22 10
S						

GCT of Transit Meridian of Greenwich

DAY	Moon h m	Venus h m	Mars h m	Jupiter h m	Saturn h m
28	9 56	8 54	8 41	21 59	10 13
29	10 43	8 53	8 39	21 54	10 09
30	11 33	8 53	8 37	21 50	10 06
31	12 28	8 52	8 35	21 46	10 02

ADDITIONAL ALTITUDE CORRECTIONS

Alt. °	Sun's Low'r Limb ′	Venus ′	Mars ′
0			
30	0.4	0.3	0.1
45	0.4	0.2	0.1
60	0.4	0.2	0.0
75	0.4	0.1	0.0
90	0.4	0.0	0.0

Moon's Lower Limb
Add

Alt. °	28 ′	29 ′	30 ′
0	16.4	17.3	18.2
4	16.4	17.3	18.2
8	16.4	17.3	18.2
12	16.4	17.3	18.2
16	16.4	17.3	18.1
20	16.4	17.2	18.1
24	16.4	17.2	18.0
28	16.3	17.1	17.9
32	16.3	17.1	17.9
36	16.3	17.0	17.8
40	16.3	17.0	17.7
44	16.2	16.9	17.6
48	16.2	16.8	17.5
52	16.2	16.8	17.4
56	16.1	16.7	17.2
60	16.1	16.6	17.1
64	16.0	16.5	17.0
68	16.0	16.4	16.8
72	15.9	16.3	16.7
76	15.9	16.2	16.6
80	15.8	16.1	16.4
84	15.8	16.0	16.3
88	15.8	16.0	16.2
90			

Add to table, back cover

Moon's Upper Limb
Subtract

Alt. °	28 ′	29 ′	30 ′
0	15.0	14.5	14.0
4	15.0	14.5	14.0
8	15.1	14.6	14.1
12	15.1	14.6	14.1
16	15.1	14.6	14.1
20	15.1	14.6	14.2
24	15.1	14.7	14.2
28	15.1	14.7	14.3
32	15.2	14.8	14.4
36	15.2	14.8	14.5
40	15.2	14.9	14.6
44	15.3	15.0	14.7
48	15.3	15.0	14.8
52	15.3	15.1	14.9
56	15.4	15.2	15.0
60	15.4	15.3	15.1
64	15.5	15.4	15.3
68	15.5	15.5	15.4
72	15.5	15.5	15.5
76	15.6	15.6	15.7
80	15.6	15.7	15.8
84	15.7	15.8	16.0
88	15.7	15.9	16.1
90			

Subtract from table, back cover

New Moon 30

GCT	♈ GHA	VENUS −4.1 GHA	VENUS Dec.	MARS 1.8 GHA	MARS Dec.	JUPITER −2.4 GHA	JUPITER Dec.	SATURN 1.1 GHA	SATURN Dec.	MOON GHA	code	MOON Dec.	code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
0	38 29.4	226 56.0	+ 3 18.0	231 00.5	+ 6 57.7	32 33.9	+ 0 50.1	209 06.3	− 1 40.2	180 04.8	78	−19 53.0	−125
1	53 31.8	241 56.3	17.4	246 01.6	57.1	47 36.6	50.0	224 08.4	40.3	194 31.6	77	20 05.5	−123
2	68 34.3	256 56.6	16.9	261 02.6	56.6	62 39.3	49.9	239 10.6	40.4	208 58.3	75	20 17.8	−122
3	83 36.7	271 57.0	·· 16.3	276 03.7	·· 56.0	77 41.9	·· 49.8	254 12.8	·· 40.5	223 24.8	75	·20 30.0	−120
4	98 39.2	286 57.3	15.7	291 04.8	55.4	92 44.6	49.7	269 15.0	40.6	237 51.3	73	20 42.0	−120
5	113 41.7	301 57.6	15.1	306 05.9	54.9	107 47.3	49.6	284 17.2	40.7	252 17.6	72	20 54.0	−118
6	128 44.1	316 57.9	+ 3 14.5	321 06.9	+ 6 54.3	122 50.0	+ 0 49.5	299 19.4	− 1 40.8	266 43.8	71	−21 05.8	−117
7	143 46.6	331 58.3	13.9	336 08.0	53.7	137 52.7	49.4	314 21.6	40.9	281 09.9	70	21 17.5	−116
8	158 49.1	346 58.6	13.4	351 09.1	53.2	152 55.4	49.4	329 23.8	41.0	295 35.9	69	21 29.1	−115
9	173 51.5	1 58.9	·· 12.8	6 10.2	·· 52.6	167 58.1	·· 49.3	344 26.0	·· 41.2	310 01.8	67	·21 40.6	−113
10	188 54.0	16 59.2	12.2	21 11.2	52.0	183 00.8	49.2	359 28.2	41.3	324 27.5	66	21 51.9	−113
11	203 56.5	31 59.6	11.6	36 12.3	51.4	198 03.4	49.1	14 30.4	41.4	338 53.1	65	22 03.2	−110
12	218 58.9	46 59.9	+ 3 11.0	51 13.4	+ 6 50.9	213 06.1	+ 0 49.0	29 32.6	− 1 41.5	353 18.6	64	−22 14.2	−110
13	234 01.4	62 00.2	10.4	66 14.4	50.3	228 08.8	48.9	44 34.8	41.6	7 44.0	63	22 25.2	−108
14	249 03.9	77 00.5	09.8	81 15.5	49.7	243 11.5	48.8	59 37.0	41.7	22 09.3	61	22 36.0	−106
15	264 06.3	92 00.8	·· 09.2	96 16.6	·· 49.2	258 14.2	·· 48.7	74 39.2	·· 41.8	36 34.4	61	·22 46.6	−106
16	279 08.8	107 01.2	08.7	111 17.7	48.6	273 16.9	48.7	89 41.4	41.9	50 59.5	59	22 57.2	−104
17	294 11.2	122 01.5	08.1	126 18.7	48.0	288 19.6	48.6	104 43.6	42.0	65 24.4	58	23 07.6	−102
18	309 13.7	137 01.8	+ 3 07.5	141 19.8	+ 6 47.5	303 22.2	+ 0 48.5	119 45.8	− 1 42.1	79 49.2	57	−23 17.8	−101
19	324 16.2	152 02.1	06.9	156 20.9	46.9	318 24.9	48.4	134 48.0	42.2	94 13.9	56	23 27.9	−100
20	339 18.6	167 02.4	06.3	171 22.0	46.3	333 27.6	48.3	149 50.2	42.3	108 38.5	55	23 37.9	− 97
21	354 21.1	182 02.7	·· 05.7	186 23.0	·· 45.8	348 30.3	·· 48.2	164 52.4	·· 42.4	123 03.0	53	·23 47.6	− 97
22	9 23.6	197 03.0	05.1	201 24.1	45.2	3 33.0	48.2	179 54.6	42.5	137 27.3	53	23 57.3	− 95
23	24 26.0	212 03.3	04.5	216 25.2	44.6	18 35.7	48.1	194 56.8	42.7	151 51.6	51	24 06.8	− 93
0	39 28.5	227 03.7	+ 3 03.9	231 26.3	+ 6 44.1	33 38.3	+ 0 48.0	209 59.0	− 1 42.8	166 15.7	50	−24 16.1	− 92
1	54 31.0	242 04.0	03.3	246 27.3	43.5	48 41.0	47.9	225 01.2	42.9	180 39.7	50	24 25.3	− 90
2	69 33.4	257 04.3	02.7	261 28.4	42.9	63 43.7	47.8	240 03.4	43.0	195 03.7	48	24 34.3	− 89
3	84 35.9	272 04.6	·· 02.1	276 29.5	·· 42.4	78 46.4	·· 47.7	255 05.6	·· 43.1	209 27.5	47	·24 43.2	− 87
4	99 38.4	287 04.9	01.5	291 30.6	41.8	93 49.1	47.6	270 07.8	43.2	223 51.2	46	24 51.9	− 85
5	114 40.8	302 05.2	00.9	306 31.7	41.2	108 51.7	47.6	285 10.0	43.3	238 14.8	45	25 00.4	− 84
6	129 43.3	317 05.5	+ 3 00.3	321 32.7	+ 6 40.7	123 54.4	+ 0 47.5	300 12.2	− 1 43.4	252 38.3	44	−25 08.8	− 82
7	144 45.7	332 05.8	2 59.7	336 33.8	40.1	138 57.1	47.4	315 14.4	43.5	267 01.7	43	25 17.0	− 80
8	159 48.2	347 06.1	59.1	351 34.9	39.5	153 59.8	47.3	330 16.6	43.6	281 25.0	43	25 25.0	− 79
9	174 50.7	2 06.4	·· 58.5	6 36.0	·· 39.0	169 02.5	·· 47.2	345 18.9	·· 43.7	295 48.3	41	·25 32.9	− 77
10	189 53.1	17 06.7	57.9	21 37.0	38.4	184 05.2	47.1	0 21.1	43.8	310 11.4	40	25 40.6	− 75
11	204 55.6	32 07.0	57.3	36 38.1	37.8	199 07.8	47.1	15 23.3	43.9	324 34.4	39	25 48.1	− 73
12	219 58.1	47 07.3	+ 2 56.7	51 39.2	+ 6 37.3	214 10.5	+ 0 47.0	30 25.5	− 1 44.0	338 57.3	39	−25 55.4	− 72
13	235 00.5	62 07.6	56.1	66 40.3	36.7	229 13.2	46.9	45 27.7	44.1	353 20.2	37	26 02.6	− 69
14	250 03.0	77 07.9	55.4	81 41.3	36.1	244 15.9	46.8	60 29.9	44.3	7 42.9	37	26 09.5	− 68
15	265 05.5	92 08.2	·· 54.8	96 42.4	·· 35.6	259 18.5	·· 46.7	75 32.1	·· 44.4	22 05.6	36	·26 16.3	− 66
16	280 07.9	107 08.5	54.2	111 43.5	35.0	274 21.2	46.6	90 34.3	44.5	36 28.2	35	26 22.9	− 65
17	295 10.4	122 08.8	53.6	126 44.6	34.4	289 23.9	46.6	105 36.5	44.6	50 50.7	34	26 29.4	− 62
18	310 12.9	137 09.1	+ 2 53.0	141 45.7	+ 6 33.9	304 26.6	+ 0 46.5	120 38.7	− 1 44.7	65 13.1	34	−26 35.6	− 61
19	325 15.3	152 09.4	52.4	156 46.7	33.3	319 29.3	46.4	135 40.9	44.8	79 35.5	32	26 41.7	− 58
20	340 17.8	167 09.6	51.8	171 47.8	32.7	334 31.9	46.3	150 43.1	44.9	93 57.7	32	26 47.5	− 57
21	355 20.2	182 09.9	·· 51.2	186 48.9	·· 32.2	349 34.6	·· 46.2	165 45.3	·· 45.0	108 19.9	32	·26 53.2	− 55
22	10 22.7	197 10.2	50.5	201 50.0	31.6	4 37.3	46.1	180 47.5	45.1	122 42.1	30	26 58.7	− 53
23	25 25.2	212 10.5	49.9	216 51.0	31.0	19 40.0	46.1	195 49.7	45.2	137 04.1	30	27 04.0	− 51
0	40 27.6	227 10.8	+ 2 49.3	231 52.1	+ 6 30.4	34 42.7	+ 0 46.0	210 51.9	− 1 45.3	151 26.1	29	−27 09.1	− 49
1	55 30.1	242 11.1	48.7	246 53.2	29.9	49 45.3	45.9	225 54.1	45.4	165 48.0	29	27 14.0	− 47
2	70 32.6	257 11.4	48.1	261 54.3	29.3	64 48.0	45.8	240 56.3	45.5	180 09.9	28	27 18.7	− 46
3	85 35.0	272 11.7	·· 47.4	276 55.4	·· 28.7	79 50.7	·· 45.7	255 58.5	·· 45.6	194 31.7	28	·27 23.3	− 43
4	100 37.5	287 11.9	46.8	291 56.4	28.2	94 53.4	45.6	271 00.7	45.7	208 53.5	27	27 27.6	− 41
5	115 40.0	302 12.2	46.2	306 57.5	27.6	109 56.0	45.6	286 02.9	45.8	223 15.2	26	27 31.7	− 39
6	130 42.4	317 12.5	+ 2 45.6	321 58.6	+ 6 27.0	124 58.7	+ 0 45.5	301 05.1	− 1 46.0	237 36.8	26	−27 35.6	− 38
7	145 44.9	332 12.8	45.0	336 59.7	26.5	140 01.4	45.4	316 07.3	46.1	251 58.4	25	27 39.4	− 35
8	160 47.3	347 13.1	44.3	352 00.8	25.9	155 04.1	45.3	331 09.5	46.2	266 19.9	26	27 42.9	− 33
9	175 49.8	2 13.3	·· 43.7	7 01.8	·· 25.3	170 06.7	·· 45.2	346 11.7	·· 46.3	280 41.5	25	·27 46.2	− 32
10	190 52.3	17 13.6	43.1	22 02.9	24.8	185 09.4	45.2	1 13.9	46.4	295 02.9	25	27 49.4	− 29
11	205 54.7	32 13.9	42.5	37 04.0	24.2	200 12.1	45.1	16 16.1	46.5	309 24.4	24	27 52.3	− 27
12	220 57.2	47 14.2	+ 2 41.8	52 05.1	+ 6 23.6	215 14.8	+ 0 45.0	31 18.3	− 1 46.6	323 45.8	24	−27 55.0	− 25
13	235 59.7	62 14.4	41.2	67 06.2	23.1	230 17.4	44.9	46 20.5	46.7	338 07.2	23	27 57.5	− 23
14	251 02.1	77 14.7	40.6	82 07.2	22.5	245 20.1	44.8	61 22.7	46.8	352 28.5	23	27 59.8	− 21
15	266 04.6	92 15.0	·· 40.0	97 08.3	·· 21.9	260 22.8	·· 44.8	76 24.9	·· 46.9	6 49.8	23	·28 01.9	− 19
16	281 07.1	107 15.3	39.3	112 09.4	21.4	275 25.4	44.7	91 27.1	47.0	21 11.1	23	28 03.8	− 17
17	296 09.5	122 15.5	38.7	127 10.5	20.8	290 28.1	44.6	106 29.3	47.1	35 32.4	23	28 05.5	− 15
18	311 12.0	137 15.8	+ 2 38.1	142 11.6	+ 6 20.2	305 30.8	+ 0 44.5	121 31.5	− 1 47.2	49 53.7	22	−28 07.0	− 13
19	326 14.5	152 16.1	37.4	157 12.6	19.7	320 33.5	44.4	136 33.7	47.3	64 14.9	23	28 08.3	− 11
20	341 16.9	167 16.4	36.8	172 13.7	19.1	335 36.1	44.4	151 35.9	47.4	78 36.2	22	28 09.4	− 9
21	356 19.4	182 16.6	·· 36.2	187 14.8	·· 18.5	350 38.8	·· 44.3	166 38.1	·· 47.5	92 57.4	22	·28 10.3	− 6
22	11 21.8	197 16.9	35.5	202 15.9	18.0	5 41.5	44.2	181 40.3	47.6	107 18.6	23	28 10.9	− 5
23	26 24.3	212 17.2	34.9	217 17.0	17.4	20 44.1	44.1	196 42.5	47.7	121 39.9	22	28 11.4	− 3
24	41 26.8	227 17.4	+ 2 34.3	232 18.1	+ 6 16.8	35 46.8	+ 0 44.0	211 44.7	− 1 47.9	136 01.1	22	−28 11.7	0
code	—	+ 3	− 6	+ 11	− 6	+ 27	− 1	+ 22	− 1				

GCT	SUN GHA	SUN Dec.
h	° ′	° ′
0	184 04.3	−13 46.5
1	199 04.3	47.3
2	214 04.3	48.1
3	229 04.3	•• 49.0
4	244 04.4	49.8
5	259 04.4	50.6
6	274 04.4	−13 51.4
7	289 04.5	52.2
8	304 04.5	53.1
9	319 04.5	•• 53.9
10	334 04.6	54.7
11	349 04.6	55.5
12	4 04.6	−13 56.3
13	19 04.6	57.1
14	34 04.7	58.0
15	49 04.7	•• 58.8
16	64 04.7	13 59.6
17	79 04.7	14 00.4
18	94 04.8	−14 01.2
19	109 04.8	02.0
20	124 04.8	02.8
21	139 04.8	•• 03.7
22	154 04.9	04.5
23	169 04.9	05.3
0	184 04.9	−14 06.1
1	199 04.9	06.9
2	214 05.0	07.7
3	229 05.0	•• 08.5
4	244 05.0	09.3
5	259 05.0	10.1
6	274 05.1	−14 11.0
7	289 05.1	11.8
8	304 05.1	12.6
9	319 05.1	•• 13.4
10	334 05.1	14.2
11	349 05.2	15.0
12	4 05.2	−14 15.8
13	19 05.2	16.6
14	34 05.2	17.4
15	49 05.2	•• 18.2
16	64 05.3	19.0
17	79 05.3	19.8
18	94 05.3	−14 20.6
19	109 05.3	21.4
20	124 05.3	22.2
21	139 05.3	•• 23.0
22	154 05.4	23.8
23	169 05.4	24.7
0	184 05.4	−14 25.5
1	199 05.4	26.3
2	214 05.4	27.1
3	229 05.4	•• 27.9
4	244 05.5	28.7
5	259 05.5	29.5
6	274 05.5	−14 30.3
7	289 05.5	31.1
8	304 05.5	31.9
9	319 05.5	•• 32.7
10	334 05.5	33.5
11	349 05.5	34.3
12	4 05.6	−14 35.0
13	19 05.6	35.8
14	34 05.6	36.6
15	49 05.6	•• 37.4
16	64 05.6	38.2
17	79 05.6	39.0
18	94 05.6	−14 39.8
19	109 05.6	40.6
20	124 05.6	41.4
21	139 05.6	•• 42.2
22	154 05.7	43.0
23	169 05.7	43.8
24	184 05.7	−14 44.6
code	—	− 8

STARS No.	SHA	Dec.	Transit Mer. Gr.
	° ′	° ′	h m
1	358 31.3	+28 49.7	21 24
2	358 20.8	+58 53.3	21 25
3	349 42.0	−18 14.9	22 00
4	339 19.8	+59 59.4	22 41
5	336 00.3	−57 28.8	22 54
6	332 17.3	+89 02.4	23 09
7	328 52.8	+23 14.4	23 23
8	315 52.9	−40 29.6	0 19
9	309 46.4	+49 41.6	0 43
10	291 42.3	+16 25.0	1 55
11	281 56.3	− 8 15.1	2 34
12	281 42.6	+45 57.2	2 35
13	279 21.5	+ 6 18.7	2 44
14	279 11.0	+28 34.3	2 45
15	276 33.2	− 1 13.6	2 55
16	271 51.3	+ 7 24.2	3 14
17	264 16.5	−52 39.7	3 44
18	259 14.4	−16 38.6	4 04
19	255 48.8	−28 54.0	4 18
20	245 48.1	+ 5 21.2	4 58
21	244 24.2	+28 08.7	5 04
22	234 37.2	−59 20.8	5 43
23	223 26.8	−43 13.9	6 27
24	221 50.2	−69 30.7	6 34
25	218 41.7	− 8 26.7	6 46
26	208 32.9	+12 12.3	7 27
27	194 48.5	+62 00.5	8 21
28	183 21.1	+14 50.5	9 07
29	174 02.2	−62 49.8	9 44
30	172 53.4	−56 50.5	9 49
31	168 47.3	−59 25.4	10 05
32	167 01.5	+56 13.1	10 12
33	159 30.4	+55 10.5	10 42
34	159 20.5	−10 54.6	10 43
35	153 35.6	+49 33.1	11 06
36	149 02.8	−36 08.0	11 24
37	146 38.3	+19 25.9	11 34
38	140 56.1	−60 38.4	11 56
39	137 18.5	+74 21.1	12 11
40	126 50.5	+26 52.5	12 53
41	120 38.1	−22 29.3	13 17
42	113 23.5	−26 19.7	13 46
43	109 07.6	−68 56.8	14 03
44	103 06.0	−15 40.1	14 27
45	97 25.2	−37 04.4	14 50
46	96 49.7	+12 35.6	14 52
47	91 08.0	+51 29.7	15 15
48	84 45.5	−34 24.8	15 40
49	81 10.6	+38 44.4	15 55
50	76 55.9	−26 21.7	16 12
51	62 53.5	+ 8 44.4	17 08
52	54 32.1	−56 53.8	17 41
53	50 03.2	+45 06.7	17 59
54	34 32.6	+ 9 39.3	19 01
55	28 41.5	−47 11.9	19 24
56	16 14.7	−29 52.7	20 14
57	14 24.4	+14 56.9	20 21

Lat.	Sunrise	Twlt. begins	Moonrise 31	Moonrise 1	Moonrise 2	Moonrise 3
N °	h m	h m	h m	h m	h m	h m
70	8 27	4 46	■	■	■	■
68	8 08	4 50	■	■	■	■
66	7 53	4 52	10 49	■	■	■
64	7 40	4 54	10 07	■	■	■
62	7 29	4 55	9 39	11 51	■	15 27
60	7 20	4 56	9 17	11 13	12 58	14 01
58	7 12	4 56	9 00	10 46	12 21	13 25
56	7 05	4 57	8 45	10 24	11 54	12 59
54	6 59	4 57	8 32	10 07	11 33	12 38
52	6 54	4 58	8 21	9 52	11 15	12 21
50	6 48	4 58	8 11	9 39	11 00	12 06
45	6 37	4 57	7 51	9 13	10 30	11 35
40	6 28	4 56	7 34	8 52	10 06	11 12
35	6 20	4 54	7 21	8 35	9 47	10 52
30	6 13	4 52	7 09	8 20	9 30	10 36
20	6 01	4 46	6 48	7 55	9 02	10 08
10	5 50	4 39	6 31	7 33	8 38	9 43
0	5 40	4 29	6 14	7 13	8 16	9 21
10	5 30	4 17	5 58	6 53	7 54	8 58
20	5 19	4 02	5 41	6 32	7 30	8 34
30	5 06	3 41	5 21	6 08	7 03	8 06
35	4 59	3 27	5 10	5 53	6 46	7 49
40	4 50	3 09	4 57	5 37	6 28	7 30
45	4 40	2 47	4 42	5 17	6 05	7 06
50	4 28	2 15	4 23	4 53	5 36	6 36
52	4 22	1 57	4 14	4 41	5 22	6 21
54	4 16	1 35	4 05	4 28	5 06	6 04
56	4 09	1 03	3 54	4 13	4 46	5 43
58	4 01	////	3 41	3 55	4 22	5 17
60	3 52	////	3 27	3 33	3 51	4 40
S						

Lat.	Sunset	Twlt. ends	Moonset 31	Moonset 1	Moonset 2	Moonset 3
N °	h m	h m	h m	h m	h m	h m
70	14 59	18 36	■	■	■	■
68	15 18	18 33	■	■	■	■
66	15 34	18 32	13 51	■	■	■
64	15 46	18 30	14 34	■	■	■
62	15 57	18 29	15 03	14 55	■	15 48
60	16 06	18 28	15 25	15 34	16 02	17 15
58	16 14	18 28	15 43	16 02	16 40	17 51
56	16 21	18 28	15 59	16 23	17 07	18 17
54	16 27	18 27	16 12	16 41	17 28	18 37
52	16 33	18 27	16 24	16 57	17 46	18 55
50	16 38	18 27	16 34	17 10	18 01	19 09
45	16 49	18 28	16 56	17 37	18 31	19 39
40	16 59	18 31	17 14	17 59	18 55	20 02
35	17 07	18 33	17 29	18 17	19 15	20 22
30	17 14	18 35	17 42	18 32	19 32	20 38
20	17 26	18 41	18 04	18 59	20 00	21 06
10	17 37	18 49	18 24	19 21	20 24	21 29
0	17 47	18 58	18 42	19 43	20 47	21 51
10	17 57	19 10	19 00	20 04	21 10	22 13
20	18 09	19 26	19 20	20 27	21 34	22 37
30	18 22	19 48	19 42	20 54	22 02	23 04
35	18 29	20 02	19 56	21 09	22 19	23 20
40	18 38	20 20	20 11	21 28	22 38	23 38
45	18 48	20 44	20 30	21 50	23 02	24 00
50	19 00	21 17	20 53	22 18	23 32	24 29
52	19 06	21 35	21 04	22 32	23 47	24 42
54	19 12	21 58	21 17	22 48	24 04	0 04
56	19 19	22 31	21 32	23 07	24 25	0 25
58	19 27	////	21 49	23 31	24 52	0 52
60	19 37	////	22 10	24 02	0 02	1 29
S						

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb	Venus	Mars
°	′	′	′
0			
	0.4	0.2	0.1
30			
	0.4	0.2	0.1
45			
	0.4	0.2	0.0
60			
	0.4	0.1	0.0
75			
	0.4	0.0	0.0
90			

Moon's Lower Limb
Add

Alt.	31	1	2
°	′	′	′
0			
	18.9	19.2	19.4
4			
	18.8	19.2	19.4
8			
	18.8	19.2	19.3
12			
	18.8	19.2	19.3
16			
	18.7	19.1	19.2
20			
	18.7	19.0	19.2
24			
	18.6	18.9	19.1
28			
	18.5	18.9	19.0
32			
	18.4	18.7	18.9
36			
	18.3	18.6	18.7
40			
	18.2	18.5	18.6
44			
	18.1	18.4	18.5
48			
	17.9	18.2	18.3
52			
	17.8	18.0	18.1
56			
	17.6	17.9	18.0
60			
	17.5	17.7	17.8
64			
	17.3	17.5	17.6
68			
	17.1	17.3	17.4
72			
	17.0	17.1	17.2
76			
	16.8	16.9	17.0
80			
	16.6	16.7	16.8
84			
	16.4	16.5	16.6
88			
	16.3	16.4	16.4
90			

Add to table, back cover

Moon's Upper Limb
Subtract

Alt.	31	1	2
°	′	′	′
0			
	13.7	13.4	13.4
4			
	13.7	13.5	13.4
8			
	13.7	13.5	13.4
12			
	13.7	13.5	13.5
16			
	13.8	13.6	13.5
20			
	13.8	13.7	13.6
24			
	13.9	13.7	13.7
28			
	14.0	13.8	13.8
32			
	14.1	13.9	13.9
36			
	14.2	14.1	14.0
40			
	14.3	14.2	14.1
44			
	14.5	14.3	14.3
48			
	14.6	14.5	14.4
52			
	14.7	14.6	14.6
56			
	14.9	14.8	14.8
60			
	15.0	15.0	15.0
64			
	15.2	15.2	15.1
68			
	15.4	15.3	15.3
72			
	15.5	15.5	15.5
76			
	15.7	15.7	15.7
80			
	15.9	15.9	15.9
84			
	16.1	16.1	16.2
88			
	16.2	16.3	16.3
90			

Subtract from table, back cover

GCT	Equation of Time (App.—Mean) 31	1	2
h	m s	m s	m s
0	+16 17.0	+16 19.7	+16 21.6
6	+16 17.7	+16 20.2	+16 21.9
12	+16 18.4	+16 20.7	+16 22.2
18	+16 19.0	+16 21.2	+16 22.5
24	+16 19.7	+16 21.6	+16 22.7

GCT of Transit Meridian of Greenwich

DAY	Moon	Venus	Mars	Jupiter	Saturn
	h m	h m	h m	h m	h m
31	12 28	8 52	8 35	21 46	10 02
1	13 28	8 52	8 34	21 42	9 59
2	14 31	8 51	8 32	21 37	9 55
3	15 36	8 51	8 30	21 33	9 52

GCT	♈	VENUS −4.1		MARS 1.8		JUPITER −2.3		SATURN 1.1		MOON			
h	GHA ° ′	GHA ° ′	Dec. ° ′	GHA ° ′	Dec. ° ′	GHA ° ′	Dec. ° ′	GHA ° ′	Dec. ° ′	GHA ° ′	code	Dec. ° ′	code
0	41 26.8	227 17.4	+ 2 34.3	232 18.1	+ 6 16.8	35 46.8	+ 0 44.0	211 44.7	− 1 47.9	136 01.1	22	−28 11.7	0
1	56 29.2	242 17.7	33.6	247 19.1	16.2	50 49.5	44.0	226 46.9	48.0	150 22.3	23	28 11.7	+ 1
2	71 31.7	257 18.0	33.0	262 20.2	15.7	65 52.2	43.9	241 49.1	48.1	164 43.6	23	28 11.6	+ 4
3	86 34.2	272 18.2	32.3	277 21.3	15.1	80 54.8	43.8	256 51.3	48.2	179 04.9	22	28 11.2	+ 6
4	101 36.6	287 18.5	31.7	292 22.4	14.5	95 57.5	43.7	271 53.5	48.3	193 26.1	23	28 10.6	+ 7
5	116 39.1	302 18.7	31.1	307 23.5	14.0	111 00.2	43.6	286 55.8	48.4	207 47.4	23	28 09.9	+ 10
6	131 41.6	317 19.0	+ 2 30.4	322 24.6	+ 6 13.4	126 02.8	+ 0 43.6	301 58.0	− 1 48.5	222 08.7	24	−28 08.9	+ 12
7	146 44.0	332 19.3	29.8	337 25.6	12.8	141 05.5	43.5	317 00.2	48.6	236 30.1	24	28 07.7	+ 14
8	161 46.5	347 19.5	29.1	352 26.7	12.3	156 08.2	43.4	332 02.4	48.7	250 51.5	24	28 06.3	+ 16
9	176 49.0	2 19.8	28.5	7 27.8	11.7	171 10.8	43.3	347 04.6	48.8	265 12.9	24	28 04.7	+ 18
10	191 51.4	17 20.0	27.9	22 28.9	11.1	186 13.5	43.3	2 06.8	48.9	279 34.3	25	28 02.9	+ 20
11	206 53.9	32 20.3	27.2	37 30.0	10.6	201 16.2	43.2	17 09.0	49.0	293 55.8	25	28 00.9	+ 22
12	221 56.3	47 20.5	+ 2 26.6	52 31.0	+ 6 10.0	216 18.8	+ 0 43.1	32 11.2	− 1 49.1	308 17.3	25	−27 58.7	+ 24
13	236 58.8	62 20.8	25.9	67 32.1	09.4	231 21.5	43.0	47 13.4	49.2	322 38.8	26	27 56.3	+ 26
14	252 01.3	77 21.1	25.3	82 33.2	08.9	246 24.2	42.9	62 15.6	49.3	337 00.4	27	27 53.7	+ 28
15	267 03.7	92 21.3	24.6	97 34.3	08.3	261 26.8	42.9	77 17.8	49.4	351 22.1	27	27 50.9	+ 30
16	282 06.2	107 21.6	24.0	112 35.4	07.7	276 29.5	42.8	92 20.0	49.5	5 43.8	27	27 47.9	+ 32
17	297 08.7	122 21.8	23.3	127 36.5	07.2	291 32.2	42.7	107 22.2	49.6	20 05.5	28	27 44.7	+ 34
18	312 11.1	137 22.1	+ 2 22.7	142 37.6	+ 6 06.6	306 34.8	+ 0 42.6	122 24.4	− 1 49.7	34 27.3	29	−27 41.3	+ 36
19	327 13.6	152 22.3	22.0	157 38.6	06.0	321 37.5	42.6	137 26.6	49.8	48 49.2	29	27 37.7	+ 38
20	342 16.1	167 22.6	21.4	172 39.7	05.5	336 40.2	42.5	152 28.8	50.0	63 11.1	29	27 33.9	+ 39
21	357 18.5	182 22.8	20.7	187 40.8	04.9	351 42.8	42.4	167 31.0	50.1	77 33.0	31	27 30.0	+ 42
22	12 21.0	197 23.1	20.1	202 41.9	04.3	6 45.5	42.3	182 33.2	50.2	91 55.1	31	27 25.8	+ 44
23	27 23.5	212 23.3	19.4	217 43.0	03.7	21 48.2	42.3	197 35.4	50.3	106 17.2	32	27 21.4	+ 46
0	42 25.9	227 23.6	+ 2 18.8	232 44.1	+ 6 03.2	36 50.8	+ 0 42.2	212 37.6	− 1 50.4	120 39.4	32	−27 16.8	+ 47
1	57 28.4	242 23.8	18.1	247 45.1	02.6	51 53.5	42.1	227 39.8	50.5	135 01.6	34	27 12.1	+ 49
2	72 30.8	257 24.0	17.5	262 46.2	02.0	66 56.2	42.0	242 42.0	50.6	149 24.0	34	27 07.2	+ 52
3	87 33.3	272 24.3	16.8	277 47.3	01.5	81 58.8	41.9	257 44.2	50.7	163 46.4	35	27 02.0	+ 53
4	102 35.8	287 24.5	16.1	292 48.4	00.9	97 01.5	41.9	272 46.5	50.8	178 08.9	35	26 56.7	+ 55
5	117 38.2	302 24.8	15.5	307 49.5	6 00.3	112 04.1	41.8	287 48.7	50.9	192 31.4	37	26 51.2	+ 57
6	132 40.7	317 25.0	+ 2 14.8	322 50.6	+ 5 59.8	127 06.8	+ 0 41.7	302 50.9	− 1 51.0	206 54.1	37	−26 45.5	+ 58
7	147 43.2	332 25.3	14.2	337 51.7	59.2	142 09.5	41.6	317 53.1	51.1	221 16.8	38	26 39.7	+ 61
8	162 45.6	347 25.5	13.5	352 52.7	58.6	157 12.1	41.6	332 55.3	51.2	235 39.6	40	26 33.6	+ 62
9	177 48.1	2 25.7	12.8	7 53.8	58.1	172 14.8	41.5	347 57.5	51.3	250 02.6	40	26 27.4	+ 64
10	192 50.6	17 26.0	12.2	22 54.9	57.5	187 17.5	41.4	2 59.7	51.4	264 25.6	41	26 21.0	+ 66
11	207 53.0	32 26.2	11.5	37 56.0	56.9	202 20.1	41.3	18 01.9	51.5	278 48.7	41	26 14.4	+ 68
12	222 55.5	47 26.4	+ 2 10.9	52 57.1	+ 5 56.4	217 22.8	+ 0 41.3	33 04.1	− 1 51.6	293 11.8	43	−26 07.6	+ 69
13	237 57.9	62 26.7	10.2	67 58.2	55.8	232 25.4	41.2	48 06.3	51.7	307 35.1	44	26 00.7	+ 71
14	253 00.4	77 26.9	09.5	82 59.3	55.2	247 28.1	41.1	63 08.5	51.8	321 58.5	45	25 53.6	+ 73
15	268 02.9	92 27.1	08.9	98 00.4	54.7	262 30.8	41.0	78 10.7	51.9	336 22.0	46	25 46.3	+ 74
16	283 05.3	107 27.4	08.2	113 01.4	54.1	277 33.4	41.0	93 12.9	52.0	350 45.6	47	25 38.9	+ 76
17	298 07.8	122 27.6	07.5	128 02.5	53.5	292 36.1	40.9	108 15.1	52.1	5 09.3	47	25 31.3	+ 78
18	313 10.3	137 27.8	+ 2 06.9	143 03.6	+ 5 52.9	307 38.7	+ 0 40.8	123 17.3	− 1 52.2	19 33.0	49	−25 23.5	+ 80
19	328 12.7	152 28.1	06.2	158 04.7	52.4	322 41.4	40.7	138 19.5	52.3	33 56.9	50	25 15.5	+ 81
20	343 15.2	167 28.3	05.5	173 05.8	51.8	337 44.1	40.7	153 21.7	52.5	48 20.9	51	25 07.4	+ 82
21	358 17.7	182 28.5	04.9	188 06.9	51.2	352 46.7	40.6	168 23.9	52.6	62 45.0	52	24 59.2	+ 85
22	13 20.1	197 28.8	04.2	203 08.0	50.7	7 49.4	40.5	183 26.2	52.7	77 09.2	53	24 50.7	+ 85
23	28 22.6	212 29.0	03.5	218 09.1	50.1	22 52.0	40.5	198 28.4	52.8	91 33.5	55	24 42.2	+ 88
0	43 25.1	227 29.2	+ 2 02.8	233 10.1	+ 5 49.5	37 54.7	+ 0 40.4	213 30.6	− 1 52.9	105 58.0	55	−24 33.4	+ 89
1	58 27.5	242 29.4	02.2	248 11.2	49.0	52 57.3	40.3	228 32.8	53.0	120 22.5	56	24 24.5	+ 90
2	73 30.0	257 29.7	01.5	263 12.3	48.4	68 00.0	40.2	243 35.0	53.1	134 47.1	58	24 15.5	+ 92
3	88 32.4	272 29.9	00.8	278 13.4	47.8	83 02.7	40.2	258 37.2	53.2	149 11.9	58	24 06.3	+ 93
4	103 34.9	287 30.1	2 00.1	293 14.5	47.3	98 05.3	40.1	273 39.4	53.3	163 36.7	60	23 57.0	+ 95
5	118 37.4	302 30.3	1 59.5	308 15.6	46.7	113 08.0	40.0	288 41.6	53.4	178 01.7	61	23 47.5	+ 97
6	133 39.8	317 30.5	+ 1 58.8	323 16.7	+ 5 46.1	128 10.6	+ 0 39.9	303 43.8	− 1 53.5	192 26.8	62	−23 37.8	+ 98
7	148 42.3	332 30.8	58.1	338 17.8	45.6	143 13.3	39.9	318 46.0	53.6	206 52.0	63	23 28.0	+ 99
8	163 44.8	347 31.0	57.4	353 18.9	45.0	158 15.9	39.8	333 48.2	53.7	221 17.3	65	23 18.1	+100
9	178 47.2	2 31.2	56.8	8 19.9	44.4	173 18.6	39.7	348 50.4	53.8	235 42.8	65	23 08.1	+102
10	193 49.7	17 31.4	56.1	23 21.0	43.9	188 21.3	39.7	3 52.6	53.9	250 08.3	67	22 57.9	+104
11	208 52.2	32 31.6	55.4	38 22.1	43.3	203 23.9	39.6	18 54.8	54.0	264 34.0	67	22 47.5	+104
12	223 54.6	47 31.9	+ 1 54.7	53 23.2	+ 5 42.7	218 26.6	+ 0 39.5	33 57.0	− 1 54.1	278 59.7	69	−22 37.1	+106
13	238 57.1	62 32.1	54.0	68 24.3	42.1	233 29.2	39.4	48 59.3	54.2	293 25.6	70	22 26.5	+108
14	253 59.6	77 32.3	53.4	83 25.4	41.6	248 31.9	39.4	64 01.5	54.3	307 51.6	72	22 15.7	+108
15	269 02.0	92 32.5	52.7	98 26.5	41.0	263 34.5	39.3	79 03.7	54.4	322 17.8	72	22 04.9	+110
16	284 04.5	107 32.7	52.0	113 27.6	40.4	278 37.2	39.2	94 05.9	54.5	336 44.0	73	21 53.9	+111
17	299 06.9	122 32.9	51.3	128 28.7	39.9	293 39.8	39.2	109 08.1	54.6	351 10.3	75	21 42.8	+113
18	314 09.4	137 33.1	+ 1 50.6	143 29.8	+ 5 39.3	308 42.5	+ 0 39.1	124 10.3	− 1 54.7	5 36.8	76	−21 31.5	+113
19	329 11.9	152 33.4	49.9	158 30.8	38.7	323 45.1	39.0	139 12.5	54.8	20 03.4	77	21 20.2	+115
20	344 14.3	167 33.6	49.3	173 31.9	38.2	338 47.8	38.9	154 14.7	54.9	34 30.1	78	21 08.7	+116
21	359 16.8	182 33.8	48.6	188 33.0	37.6	353 50.4	38.9	169 16.9	55.0	48 56.9	79	20 57.1	+117
22	14 19.3	197 34.0	47.9	203 34.1	37.0	8 53.1	38.8	184 19.1	55.1	63 23.8	80	20 45.4	+118
23	29 21.7	212 34.2	47.2	218 35.2	36.5	23 55.7	38.7	199 21.3	55.2	77 50.8	82	20 33.6	+120
24	44 24.2	227 34.4	+ 1 46.5	233 36.3	+ 5 35.9	38 58.4	+ 0 38.7	214 23.5	− 1 55.3	92 18.0	83	−20 21.6	+120
code	—	+ 3	− 7	+ 11	− 6	+ 26	− 1	+ 22	− 1				

GCT	SUN GHA	SUN Dec.
h	° ′	° ′
0	184 05.7	−14 44.6
1	199 05.7	45.4
2	214 05.7	46.2
3	229 05.7	•• 47.0
4	244 05.7	47.7
5	259 05.7	48.5
6	274 05.7	−14 49.3
7	289 05.7	50.1
8	304 05.7	50.9
9	319 05.7	•• 51.7
10	334 05.7	52.5
11	349 05.7	53.3
12	4 05.7	−14 54.1
13	19 05.7	54.8
14	34 05.7	55.6
15	49 05.7	•• 56.4
16	64 05.7	57.2
17	79 05.7	58.0
18	94 05.7	−14 58.8
19	109 05.7	14 59.6
20	124 05.7	15 00.3
21	139 05.7	•• 01.1
22	154 05.7	01.9
23	169 05.7	02.7
0	184 05.7	−15 03.5
1	199 05.7	04.3
2	214 05.7	05.0
3	229 05.7	•• 05.8
4	244 05.7	06.6
5	259 05.7	07.4
6	274 05.7	−15 08.2
7	289 05.7	08.9
8	304 05.7	09.7
9	319 05.7	•• 10.5
10	334 05.7	11.3
11	349 05.7	12.0
12	4 05.7	−15 12.8
13	19 05.7	13.6
14	34 05.7	14.4
15	49 05.7	•• 15.2
16	64 05.7	15.9
17	79 05.7	16.7
18	94 05.7	−15 17.5
19	109 05.7	18.2
20	124 05.7	19.0
21	139 05.7	•• 19.8
22	154 05.6	20.6
23	169 05.6	21.3
0	184 05.6	−15 22.1
1	199 05.6	22.9
2	214 05.6	23.7
3	229 05.6	•• 24.4
4	244 05.6	25.2
5	259 05.6	26.0
6	274 05.6	−15 26.7
7	289 05.6	27.5
8	304 05.5	28.3
9	319 05.5	•• 29.0
10	334 05.5	29.8
11	349 05.5	30.6
12	4 05.5	−15 31.3
13	19 05.5	32.1
14	34 05.5	32.9
15	49 05.4	•• 33.6
16	64 05.4	34.4
17	79 05.4	35.2
18	94 05.4	−15 35.9
19	109 05.4	36.7
20	124 05.4	37.5
21	139 05.4	•• 38.2
22	154 05.3	39.0
23	169 05.3	39.7
24	184 05.3	−15 40.5
code	—	− 8

STARS No.	SHA	Dec.	Transit Mer. Gr.
	° ′	° ′	h m
1	358 31.3	+28 49.7	21 13
2	358 20.8	+58 53.3	21 13
3	349 42.0	−18 14.9	21 48
4	339 19.8	+59 59.4	22 29
5	336 00.3	−57 28.8	22 43
6	332 17.3	+89 02.5	22 57
7	328 52.8	+23 14.4	23 11
8	315 52.9	−40 29.6	0 07
9	309 46.4	+49 41.7	0 31
10	291 42.3	+16 25.0	1 43
11	281 56.3	− 8 15.1	2 22
12	281 42.6	+45 57.2	2 23
13	279 21.5	+ 6 18.7	2 32
14	279 10.9	+28 34.3	2 33
15	276 33.1	− 1 13.6	2 44
16	271 51.2	+ 7 24.2	3 02
17	264 16.4	−52 39.7	3 33
18	259 14.4	−16 38.6	3 53
19	255 48.8	−28 54.0	4 06
20	245 48.1	+ 5 21.2	4 46
21	244 24.2	+28 08.7	4 52
22	234 37.1	−59 20.8	5 31
23	223 26.7	−43 13.9	6 15
24	221 50.1	−69 30.7	6 22
25	218 41.7	− 8 26.7	6 34
26	208 32.9	+12 12.3	7 15
27	194 48.4	+62 00.5	8 10
28	183 21.1	+14 50.5	8 55
29	174 02.1	−62 49.8	9 33
30	172 53.4	−56 50.5	9 37
31	168 47.3	−59 25.4	9 53
32	167 01.5	+56 13.1	10 01
33	159 30.4	+55 10.5	10 31
34	159 20.5	−10 54.6	10 31
35	153 35.6	+49 33.1	10 54
36	149 02.8	−36 08.0	11 12
37	146 38.3	+19 25.9	11 22
38	140 56.1	−60 38.4	11 45
39	137 18.5	+74 21.0	11 59
40	126 50.5	+26 52.5	12 41
41	120 38.1	−22 29.3	13 06
42	113 23.5	−26 19.7	13 34
43	109 07.6	−68 56.8	13 51
44	103 06.0	−15 40.1	14 16
45	97 25.2	−37 04.4	14 38
46	96 49.7	+12 35.6	14 41
47	91 08.0	+51 29.7	15 03
48	84 45.5	−34 24.8	15 29
49	81 10.6	+38 44.4	15 43
50	76 55.9	−26 21.7	16 00
51	62 53.5	+ 8 44.4	16 56
52	54 32.1	−56 53.8	17 29
53	50 03.2	+45 06.7	17 47
54	34 32.6	+ 9 39.3	18 49
55	28 41.5	−47 11.9	19 12
56	16 14.7	−29 52.7	20 02
57	14 24.4	+14 56.9	20 09

Lat.	Sunrise	Twlt. begins	Moonrise 3	Moonrise 4	Moonrise 5	Moonrise 6
N °	h m	h m	h m	h m	h m	h m
70	8 42	4 56	■	■	■	16 15
68	8 20	4 58	■	■	17 07	15 43
66	8 03	5 00	■	■	15 55	15 20
64	7 50	5 01	■	16 06	15 18	15 02
62	7 38	5 02	15 27	14 59	14 52	14 47
60	7 28	5 02	14 01	14 24	14 31	14 34
58	7 19	5 02	13 25	13 58	14 14	14 23
56	7 12	5 03	12 59	13 38	14 00	14 13
54	7 05	5 02	12 38	13 21	13 47	14 04
52	6 59	5 02	12 21	13 06	13 36	13 56
50	6 53	5 02	12 06	12 53	13 26	13 49
45	6 42	5 00	11 35	12 27	13 05	13 34
40	6 32	4 58	11 12	12 06	12 48	13 22
35	6 23	4 56	10 52	11 48	12 34	13 11
30	6 16	4 54	10 36	11 33	12 21	13 02
20	6 03	4 47	10 08	11 07	12 00	12 45
10	5 51	4 39	9 43	10 45	11 41	12 31
0	5 40	4 29	9 21	10 24	11 23	12 18
10	5 29	4 16	8 58	10 03	11 06	12 04
20	5 17	4 00	8 34	9 41	10 47	11 50
30	5 03	3 37	8 06	9 15	10 25	11 33
35	4 56	3 22	7 49	8 59	10 12	11 23
40	4 46	3 04	7 30	8 41	9 57	11 12
45	4 36	2 40	7 06	8 20	9 39	10 59
50	4 23	2 05	6 36	7 52	9 17	10 43
52	4 16	1 45	6 21	7 39	9 06	10 35
54	4 10	1 20	6 04	7 23	8 54	10 27
56	4 02	0 39	5 43	7 05	8 40	10 17
58	3 54	////	5 17	6 42	8 24	10 06
60	3 44	////	4 40	6 13	8 04	9 54
S						

Lat.	Sunset	Twlt. ends	Moonset 3	Moonset 4	Moonset 5	Moonset 6
N °	h m	h m	h m	h m	h m	h m
70	14 44	18 26	■	■	■	21 09
68	15 06	18 25	■	■	18 25	21 39
66	15 23	18 24	■	■	19 35	22 00
64	15 37	18 23	■	17 22	20 11	22 18
62	15 48	18 22	15 48	18 28	20 36	22 31
60	15 58	18 22	17 15	19 03	20 56	22 43
58	16 07	18 22	17 51	19 28	21 12	22 53
56	16 15	18 22	18 17	19 48	21 26	23 02
54	16 21	18 22	18 37	20 05	21 38	23 10
52	16 28	18 23	18 55	20 19	21 48	23 17
50	16 33	18 23	19 09	20 31	21 58	23 23
45	16 45	18 25	19 39	20 57	22 17	23 36
40	16 55	18 27	20 02	21 17	22 33	23 47
35	17 04	18 30	20 22	21 34	22 46	23 57
30	17 11	18 32	20 38	21 48	22 58	24 05
20	17 24	18 39	21 06	22 12	23 17	24 19
10	17 36	18 48	21 29	22 33	23 34	24 31
0	17 47	18 58	21 51	22 53	23 50	24 42
10	17 58	19 11	22 13	23 12	24 05	0 05
20	18 10	19 28	22 37	23 33	24 22	0 22
30	18 24	19 51	23 04	23 56	24 41	0 41
35	18 32	20 06	23 20	24 10	0 10	0 52
40	18 41	20 25	23 38	24 26	0 26	1 04
45	18 52	20 50	24 00	0 00	0 45	1 18
50	19 06	21 27	24 29	0 29	1 08	1 36
52	19 12	21 47	24 42	0 42	1 20	1 45
54	19 19	22 14	0 04	0 58	1 32	1 54
56	19 26	22 59	0 25	1 17	1 47	2 04
58	19 35	////	0 52	1 40	2 04	2 16
60	19 45	////	1 29	2 09	2 24	2 30
S						

GCT	Equation of Time (App.—Mean) 3	4	5
h	m s	m s	m s
0	+16 22.7	+16 23.0	+16 22.5
6	+16 22.8	+16 23.0	+16 22.3
12	+16 22.9	+16 22.9	+16 22.0
18	+16 23.0	+16 22.7	+16 21.7
24	+16 23.0	+16 22.5	+16 21.3

GCT of Transit
Meridian of Greenwich

DAY	Moon	Venus	Mars	Jupiter	Saturn
	h m	h m	h m	h m	h m
3	15 36	8 51	8 30	21 33	9 52
4	16 39	8 50	8 29	21 29	9 48
5	17 37	8 50	8 27	21 25	9 45
6	18 30	8 50	8 25	21 20	9 41

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb	Venus	Mars
°	′	′	′
0			
	0.5	0.2	0.1
30			
	0.5	0.2	0.1
45			
	0.5	0.1	0.0
60			
	0.5	0.1	0.0
75			
	0.5	0.0	0.0
90			

Moon's Lower Limb
Add

Alt.	3	4	5
°	′	′	′
0			
	19.2	18.9	18.5
4			
	19.2	18.8	18.5
8			
	19.2	18.8	18.4
12			
	19.2	18.8	18.4
16			
	19.1	18.7	18.4
20			
	19.0	18.7	18.3
24			
	18.9	18.6	18.2
28			
	18.9	18.5	18.2
32			
	18.7	18.4	18.1
36			
	18.6	18.3	18.0
40			
	18.5	18.2	17.9
44			
	18.4	18.1	17.8
48			
	18.2	17.9	17.7
52			
	18.0	17.8	17.5
56			
	17.9	17.6	17.4
60			
	17.7	17.5	17.3
64			
	17.5	17.3	17.1
68			
	17.3	17.1	17.0
72			
	17.1	17.0	16.8
76			
	16.9	16.8	16.7
80			
	16.7	16.6	16.5
84			
	16.5	16.4	16.3
88			
	16.4	16.3	16.2
90			

Add to table, back cover

Moon's Upper Limb
Subtract

Alt.	3	4	5
°	′	′	′
0			
	13.4	13.7	13.9
4			
	13.5	13.7	13.9
8			
	13.5	13.7	13.9
12			
	13.5	13.7	13.9
16			
	13.6	13.8	14.0
20			
	13.7	13.8	14.0
24			
	13.7	13.9	14.1
28			
	13.8	14.0	14.2
32			
	13.9	14.1	14.3
36			
	14.1	14.2	14.4
40			
	14.2	14.3	14.5
44			
	14.3	14.5	14.6
48			
	14.5	14.6	14.7
52			
	14.6	14.7	14.8
56			
	14.8	14.9	15.0
60			
	15.0	15.0	15.1
64			
	15.2	15.2	15.2
68			
	15.3	15.4	15.4
72			
	15.5	15.5	15.5
76			
	15.7	15.7	15.7
80			
	15.9	15.9	15.9
84			
	16.1	16.1	16.0
88			
	16.3	16.2	16.1
90			

Subtract from table, back cover

GCT	♈ GHA	VENUS −4.1 GHA	VENUS Dec.	MARS 1.8 GHA	MARS Dec.	JUPITER −2.3 GHA	JUPITER Dec.	SATURN 1.1 GHA	SATURN Dec.	MOON GHA	code	MOON Dec.	code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
0	44 24.2	227 34.4	+ 1 46.5	233 36.3	+ 5 35.9	38 58.4	+ 0 38.7	214 23.5	− 1 55.3	92 18.0	83	−20 21.6	+120
1	59 26.7	242 34.6	45.8	248 37.4	35.3	54 01.0	38.6	229 25.7	55.4	106 45.3	83	20 09.6	+122
2	74 29.1	257 34.8	45.1	263 38.5	34.8	69 03.7	38.5	244 27.9	55.6	121 12.6	85	19 57.4	+123
3	89 31.6	272 35.0	•• 44.4	278 39.6	•• 34.2	84 06.3	•• 38.4	259 30.2	•• 55.7	135 40.1	86	·19 45.1	+123
4	104 34.1	287 35.2	43.7	293 40.7	33.6	99 09.0	38.4	274 32.4	55.8	150 07.7	87	19 32.8	+125
5	119 36.5	302 35.4	43.0	308 41.8	33.1	114 11.6	38.3	289 34.6	55.9	164 35.4	89	19 20.3	+126
6	134 39.0	317 35.6	+ 1 42.4	323 42.8	+ 5 32.5	129 14.3	+ 0 38.2	304 36.8	− 1 56.0	179 03.3	89	−19 07.7	+126
7	149 41.4	332 35.8	41.7	338 43.9	31.9	144 16.9	38.2	319 39.0	56.1	193 31.2	90	18 55.1	+128
8	164 43.9	347 36.0	41.0	353 45.0	31.3	159 19.6	38.1	334 41.2	56.2	207 59.2	92	18 42.3	+129
9	179 46.4	2 36.2	•• 40.3	8 46.1	•• 30.8	174 22.2	•• 38.0	349 43.4	•• 56.3	222 27.4	92	·18 29.4	+129
10	194 48.8	17 36.4	39.6	23 47.2	30.2	189 24.9	38.0	4 45.6	56.4	236 55.6	94	18 16.5	+131
11	209 51.3	32 36.6	38.9	38 48.3	29.6	204 27.5	37.9	19 47.8	56.5	251 24.0	95	18 03.4	+132
12	224 53.8	47 36.8	+ 1 38.2	53 49.4	+ 5 29.1	219 30.2	+ 0 37.8	34 50.0	− 1 56.6	265 52.5	95	−17 50.2	+132
13	239 56.2	62 37.0	37.5	68 50.5	28.5	234 32.8	37.8	49 52.2	56.7	280 21.0	97	17 37.0	+133
14	254 58.7	77 37.2	36.8	83 51.6	27.9	249 35.5	37.7	64 54.4	56.8	294 49.7	98	17 23.7	+134
15	270 01.2	92 37.4	•• 36.1	98 52.7	•• 27.4	264 38.1	•• 37.6	79 56.7	•• 56.9	309 18.5	99	·17 10.3	+135
16	285 03.6	107 37.6	35.4	113 53.8	26.8	279 40.8	37.6	94 58.9	57.0	323 47.4	100	16 56.8	+136
17	300 06.1	122 37.8	34.7	128 54.9	26.2	294 43.4	37.5	110 01.1	57.1	338 16.4	101	16 43.2	+136
18	315 08.6	137 38.0	+ 1 34.0	143 56.0	+ 5 25.7	309 46.1	+ 0 37.4	125 03.3	− 1 57.2	352 45.5	102	−16 29.6	+138
19	330 11.0	152 38.2	33.3	158 57.1	25.1	324 48.7	37.3	140 05.5	57.3	7 14.7	102	16 15.8	+138
20	345 13.5	167 38.4	32.6	173 58.1	24.5	339 51.4	37.3	155 07.7	57.4	21 43.9	104	16 02.0	+139
21	0 15.9	182 38.6	•• 31.9	188 59.2	•• 24.0	354 54.0	•• 37.2	170 09.9	•• 57.5	36 13.3	105	·15 48.1	+140
22	15 18.4	197 38.8	31.2	204 00.3	23.4	9 56.7	37.1	185 12.1	57.6	50 42.8	106	15 34.1	+140
23	30 20.9	212 39.0	30.5	219 01.4	22.8	24 59.3	37.1	200 14.3	57.7	65 12.4	107	15 20.1	+141
0	45 23.3	227 39.1	+ 1 29.8	234 02.5	+ 5 22.2	40 01.9	+ 0 37.0	215 16.5	− 1 57.8	79 42.1	107	−15 06.0	+142
1	60 25.8	242 39.3	29.0	249 03.6	21.7	55 04.6	36.9	230 18.7	57.9	94 11.8	109	14 51.8	+142
2	75 28.3	257 39.5	28.3	264 04.7	21.1	70 07.2	36.9	245 21.0	58.0	108 41.7	109	14 37.6	+143
3	90 30.7	272 39.7	•• 27.6	279 05.8	•• 20.5	85 09.9	•• 36.8	260 23.2	•• 58.1	123 11.6	111	·14 23.3	+144
4	105 33.2	287 39.9	26.9	294 06.9	20.0	100 12.5	36.7	275 25.4	58.2	137 41.7	111	14 08.9	+144
5	120 35.7	302 40.1	26.2	309 08.0	19.4	115 15.2	36.7	290 27.6	58.3	152 11.8	112	13 54.5	+145
6	135 38.1	317 40.3	+ 1 25.5	324 09.1	+ 5 18.8	130 17.8	+ 0 36.6	305 29.8	− 1 58.4	166 42.0	113	−13 40.0	+146
7	150 40.6	332 40.4	24.8	339 10.2	18.3	145 20.4	36.5	320 32.0	58.5	181 12.3	114	13 25.4	+146
8	165 43.0	347 40.6	24.1	354 11.3	17.7	160 23.1	36.5	335 34.2	58.6	195 42.7	115	13 10.8	+147
9	180 45.5	2 40.8	•• 23.4	9 12.4	•• 17.1	175 25.7	•• 36.4	350 36.4	•• 58.7	210 13.2	116	·12 56.1	+147
10	195 48.0	17 41.0	22.7	24 13.5	16.6	190 28.4	36.3	5 38.6	58.8	224 43.8	116	12 41.4	+148
11	210 50.4	32 41.2	21.9	39 14.6	16.0	205 31.0	36.3	20 40.8	58.9	239 14.4	117	12 26.6	+148
12	225 52.9	47 41.4	+ 1 21.2	54 15.7	+ 5 15.4	220 33.7	+ 0 36.2	35 43.1	− 1 59.0	253 45.1	118	−12 11.8	+149
13	240 55.4	62 41.5	20.5	69 16.8	14.9	235 36.3	36.1	50 45.3	59.1	268 15.9	119	11 56.9	+150
14	255 57.8	77 41.7	19.8	84 17.9	14.3	250 38.9	36.1	65 47.5	59.2	282 46.8	120	11 41.9	+149
15	271 00.3	92 41.9	•• 19.1	99 18.9	•• 13.7	265 41.6	•• 36.0	80 49.7	•• 59.3	297 17.8	120	·11 27.0	+151
16	286 02.8	107 42.1	18.4	114 20.0	13.2	280 44.2	35.9	95 51.9	59.4	311 48.8	121	11 11.9	+150
17	301 05.2	122 42.2	17.7	129 21.1	12.6	295 46.9	35.9	110 54.1	59.5	326 19.9	122	10 56.9	+152
18	316 07.7	137 42.4	+ 1 16.9	144 22.2	+ 5 12.0	310 49.5	+ 0 35.8	125 56.3	− 1 59.6	340 51.1	122	−10 41.7	+151
19	331 10.2	152 42.6	16.2	159 23.3	11.4	325 52.1	35.8	140 58.5	59.7	355 22.3	124	10 26.6	+152
20	346 12.6	167 42.8	15.5	174 24.4	10.9	340 54.8	35.7	156 00.7	59.8	9 53.7	124	10 11.4	+153
21	1 15.1	182 42.9	•• 14.8	189 25.5	•• 10.3	355 57.4	•• 35.6	171 03.0	• 1 59.9	24 25.1	124	· 9 56.1	+152
22	16 17.5	197 43.1	14.1	204 26.6	09.7	11 00.0	35.6	186 05.2	2 00.0	38 56.5	126	9 40.9	+153
23	31 20.0	212 43.3	13.3	219 27.7	09.2	26 02.7	35.5	201 07.4	00.1	53 28.1	126	9 25.6	+154
0	46 22.5	227 43.5	+ 1 12.6	234 28.8	+ 5 08.6	41 05.3	+ 0 35.4	216 09.6	− 2 00.2	67 59.7	126	− 9 10.2	+154
1	61 24.9	242 43.6	11.9	249 29.9	08.0	56 08.0	35.4	231 11.8	00.3	82 31.3	127	8 54.8	+154
2	76 27.4	257 43.8	11.2	264 31.0	07.5	71 10.6	35.3	246 14.0	00.4	97 03.0	128	8 39.4	+154
3	91 29.9	272 44.0	•• 10.4	279 32.1	•• 06.9	86 13.2	•• 35.2	261 16.2	•• 00.5	111 34.8	129	· 8 24.0	+155
4	106 32.3	287 44.1	09.7	294 33.2	06.3	101 15.9	35.2	276 18.4	00.6	126 06.7	129	8 08.5	+155
5	121 34.8	302 44.3	09.0	309 34.3	05.8	116 18.5	35.1	291 20.6	00.7	140 38.6	129	7 53.0	+155
6	136 37.3	317 44.5	+ 1 08.3	324 35.4	+ 5 05.2	131 21.1	+ 0 35.1	306 22.9	− 2 00.8	155 10.5	130	− 7 37.5	+156
7	151 39.7	332 44.6	07.5	339 36.5	04.6	146 23.8	35.0	321 25.1	00.9	169 42.5	131	7 21.9	+155
8	166 42.2	347 44.8	06.8	354 37.6	04.1	161 26.4	34.9	336 27.3	01.0	184 14.6	131	7 06.4	+156
9	181 44.7	2 45.0	•• 06.1	9 38.7	•• 03.5	176 29.0	•• 34.9	351 29.5	•• 01.1	198 46.7	132	· 6 50.8	+157
10	196 47.1	17 45.1	05.4	24 39.8	02.9	191 31.7	34.8	6 31.7	01.2	213 18.9	133	6 35.1	+156
11	211 49.6	32 45.3	04.6	39 40.9	02.4	206 34.3	34.7	21 33.9	01.3	227 51.2	132	6 19.5	+157
12	226 52.0	47 45.5	+ 1 03.9	54 42.0	+ 5 01.8	221 37.0	+ 0 34.7	36 36.1	− 2 01.4	242 23.4	134	− 6 03.8	+156
13	241 54.5	62 45.6	03.2	69 43.1	01.2	236 39.6	34.6	51 38.3	01.5	256 55.8	133	5 48.2	+157
14	256 57.0	77 45.8	02.4	84 44.2	00.6	251 42.2	34.6	66 40.5	01.7	271 28.1	135	5 32.5	+157
15	271 59.4	92 45.9	•• 01.7	99 45.3	• 5 00.1	266 44.9	•• 34.5	81 42.8	•• 01.8	286 00.6	134	· 5 16.8	+158
16	287 01.9	107 46.1	01.0	114 46.4	4 59.5	281 47.5	34.4	96 45.0	01.9	300 33.0	135	5 01.0	+157
17	302 04.4	122 46.3	1 00.2	129 47.5	58.9	296 50.1	34.4	111 47.2	02.0	315 05.5	136	4 45.3	+157
18	317 06.8	137 46.4	+ 0 59.5	144 48.6	+ 4 58.4	311 52.8	+ 0 34.3	126 49.4	− 2 02.1	329 38.1	136	− 4 29.6	+158
19	332 09.3	152 46.6	58.8	159 49.7	57.8	326 55.4	34.2	141 51.6	02.2	344 10.7	136	4 13.8	+158
20	347 11.8	167 46.7	58.0	174 50.8	57.2	341 58.0	34.2	156 53.8	02.3	358 43.3	137	3 58.0	+157
21	2 14.2	182 46.9	•• 57.3	189 51.9	•• 56.7	357 00.6	•• 34.1	171 56.0	•• 02.4	13 16.0	137	· 3 42.3	+158
22	17 16.7	197 47.0	56.6	204 53.0	56.1	12 03.3	34.1	186 58.2	02.5	27 48.7	137	3 26.5	+158
23	32 19.1	212 47.2	55.8	219 54.1	55.5	27 05.9	34.0	202 00.5	02.6	42 21.4	138	3 10.7	+158
24	47 21.6	227 47.4	+ 0 55.1	234 55.2	+ 4 55.0	42 08.5	+ 0 33.9	217 02.7	− 2 02.7	56 54.2	138	− 2 54.9	+158
code	—	+ 1	− 7	+ 11	− 5	+ 26	− 1	+ 22	− 1				

GCT	SUN GHA	SUN Dec.
h	° ′	° ′
0	184 05.3	−15 40.5
1	199 05.3	41.3
2	214 05.3	42.0
3	229 05.3 ••	42.8
4	244 05.2	43.5
5	259 05.2	44.3
6	274 05.2	−15 45.1
7	289 05.2	45.8
8	304 05.2	46.6
9	319 05.1 ••	47.3
10	334 05.1	48.1
11	349 05.1	48.8
12	4 05.1	−15 49.6
13	19 05.0	50.3
14	34 05.0	51.1
15	49 05.0 ••	51.9
16	64 05.0	52.6
17	79 05.0	53.4
18	94 04.9	−15 54.1
19	109 04.9	54.9
20	124 04.9	55.6
21	139 04.9 ••	56.4
22	154 04.8	57.1
23	169 04.8	57.9
0	184 04.8	−15 58.6
1	199 04.8	15 59.4
2	214 04.7	16 00.1
3	229 04.7 ••	00.9
4	244 04.7	01.6
5	259 04.6	02.4
6	274 04.6	−16 03.1
7	289 04.6	03.9
8	304 04.6	04.6
9	319 04.5 ••	05.4
10	334 04.5	06.1
11	349 04.5	06.8
12	4 04.4	−16 07.6
13	19 04.4	08.3
14	34 04.4	09.1
15	49 04.3 ••	09.8
16	64 04.3	10.6
17	79 04.3	11.3
18	94 04.3	−16 12.0
19	109 04.2	12.8
20	124 04.2	13.5
21	139 04.2 ••	14.3
22	154 04.1	15.0
23	169 04.1	15.7
0	184 04.1	−16 16.5
1	199 04.0	17.2
2	214 04.0	18.0
3	229 03.9 ••	18.7
4	244 03.9	19.4
5	259 03.9	20.2
6	274 03.8	−16 20.9
7	289 03.8	21.6
8	304 03.8	22.4
9	319 03.7 ••	23.1
10	334 03.7	23.8
11	349 03.7	24.6
12	4 03.6	−16 25.3
13	19 03.6	26.0
14	34 03.5	26.8
15	49 03.5 ••	27.5
16	64 03.5	28.2
17	79 03.4	29.0
18	94 03.4	−16 29.7
19	109 03.3	30.4
20	124 03.3	31.2
21	139 03.2 ••	31.9
22	154 03.2	32.6
23	169 03.2	33.3
24	184 03.1	−16 34.1
code	—	−7

STARS No.	SHA	Dec.	Transit Mer. Gr.
	° ′	° ′	h m
1	358 31.3	+28 49.7	21 01
2	358 20.8	+58 53.3	21 02
3	349 42.0	−18 14.9	21 36
4	339 19.8	+59 59.4	22 17
5	336 00.3	−57 28.8	22 31
6	332 17.4	+89 02.5	22 46
7	328 52.8	+23 14.4	22 59
8	315 52.9	−40 29.6	23 51
9	309 46.4	+49 41.7	0 19
10	291 42.3	+16 25.0	1 31
11	281 56.3	− 8 15.1	2 10
12	281 42.6	+45 57.2	2 11
13	279 21.4	+ 6 18.7	2 21
14	279 10.9	+28 34.3	2 21
15	276 33.1	− 1 13.6	2 32
16	271 51.2	+ 7 24.2	2 51
17	264 16.4	−52 39.7	3 21
18	259 14.3	−16 38.6	3 41
19	255 48.8	−28 54.0	3 55
20	245 48.1	+ 5 21.2	4 34
21	244 24.2	+28 08.7	4 40
22	234 37.1	−59 20.8	5 19
23	223 26.7	−43 13.9	6 04
24	221 50.1	−69 30.7	6 10
25	218 41.7	− 8 26.7	6 23
26	208 32.8	+12 12.3	7 03
27	194 48.4	+62 00.5	7 58
28	183 21.0	+14 50.5	8 44
29	174 02.1	−62 49.8	9 21
30	172 53.4	−56 50.4	9 25
31	168 47.3	−59 25.4	9 42
32	167 01.5	+56 13.1	9 49
33	159 30.4	+55 10.4	10 19
34	159 20.5	−10 54.6	10 19
35	153 35.6	+49 33.1	10 42
36	149 02.8	−36 08.0	11 00
37	146 38.3	+19 25.9	11 10
38	140 56.1	−60 38.4	11 33
39	137 18.5	+74 21.0	11 47
40	126 50.5	+26 52.5	12 29
41	120 38.1	−22 29.2	12 54
42	113 23.5	−26 19.7	13 23
43	109 07.6	−68 56.8	13 40
44	103 06.0	−15 40.1	14 04
45	97 25.2	−37 04.4	14 26
46	96 49.7	+12 35.6	14 29
47	91 08.1	+51 29.7	14 51
48	84 45.5	−34 24.8	15 17
49	81 10.6	+38 44.4	15 31
50	76 55.9	−26 21.7	15 48
51	62 53.5	+ 8 44.4	16 44
52	54 32.1	−56 53.8	17 17
53	50 03.3	+45 06.7	17 35
54	34 32.6	+ 9 39.3	18 37
55	28 41.5	−47 11.9	19 01
56	16 14.7	−29 52.7	19 50
57	14 24.4	+14 56.9	19 58

Lat.	Sunrise	Twlt. begins	Moonrise 6	7	8	9
N °	h m	h m	h m	h m	h m	h m
70	8 58	5 07	16 15	15 27	14 56	14 30
68	8 33	5 08	15 43	15 13	14 50	14 31
66	8 14	5 09	15 20	15 01	14 45	14 32
64	7 59	5 09	15 02	14 50	14 41	14 32
62	7 47	5 09	14 47	14 42	14 37	14 33
60	7 36	5 09	14 34	14 34	14 34	14 33
58	7 26	5 08	14 23	14 28	14 31	14 34
56	7 18	5 08	14 13	14 22	14 28	14 34
54	7 11	5 08	14 04	14 16	14 26	14 35
52	7 04	5 07	13 56	14 12	14 24	14 35
50	6 58	5 07	13 49	14 07	14 22	14 35
45	6 46	5 04	13 34	13 58	14 17	14 36
40	6 35	5 02	13 22	13 50	14 14	14 36
35	6 26	4 59	13 11	13 43	14 11	14 37
30	6 18	4 56	13 02	13 37	14 08	14 37
20	6 04	4 49	12 45	13 26	14 03	14 38
10	5 52	4 40	12 31	13 17	13 59	14 39
0	5 40	4 29	12 18	13 08	13 55	14 39
10	5 29	4 16	12 04	12 59	13 50	14 40
20	5 16	3 58	11 50	12 50	13 46	14 41
30	5 01	3 34	11 33	12 39	13 41	14 42
35	4 53	3 19	11 23	12 32	13 38	14 42
40	4 43	2 59	11 12	12 25	13 35	14 43
45	4 32	2 33	10 59	12 17	13 31	14 43
50	4 18	1 55	10 43	12 07	13 27	14 44
52	4 11	1 34	10 35	12 02	13 25	14 45
54	4 04	1 04	10 27	11 57	13 22	14 45
56	3 56	////	10 17	11 51	13 20	14 46
58	3 47	////	10 06	11 44	13 17	14 46
60	3 36	////	9 54	11 37	13 14	14 47
S						

Lat.	Sunset	Twlt. ends	Moonset 6	7	8	9
N °	h m	h m	h m	h m	h m	h m
70	14 28	18 16	21 09	23 39	25 47	1 47
68	14 53	18 16	21 39	23 52	25 50	1 50
66	15 12	18 15	22 00	24 02	0 02	1 53
64	15 27	18 15	22 18	24 10	0 10	1 55
62	15 40	18 16	22 31	24 17	0 17	1 57
60	15 51	18 16	22 43	24 23	0 23	1 58
58	16 00	18 16	22 53	24 29	0 29	2 00
56	16 08	18 16	23 02	24 34	0 34	2 01
54	16 16	18 18	23 10	24 38	0 38	2 02
52	16 22	18 18	23 17	24 42	0 42	2 03
50	16 28	18 19	23 23	24 45	0 45	2 04
45	16 41	18 21	23 36	24 53	0 53	2 06
40	16 52	18 24	23 47	24 59	0 59	2 08
35	17 01	18 27	23 57	25 04	1 04	2 09
30	17 09	18 31	24 05	0 05	1 09	2 10
20	17 23	18 38	24 19	0 19	1 17	2 12
10	17 36	18 48	24 31	0 31	1 24	2 14
0	17 47	18 59	24 42	0 42	1 30	2 16
10	17 59	19 13	0 05	0 53	1 37	2 18
20	18 12	19 31	0 22	1 05	1 44	2 19
30	18 26	19 54	0 41	1 18	1 51	2 21
35	18 35	20 10	0 52	1 26	1 55	2 23
40	18 45	20 30	1 04	1 35	2 00	2 24
45	18 57	20 57	1 18	1 45	2 06	2 25
50	19 11	21 36	1 36	1 57	2 13	2 27
52	19 17	21 58	1 45	2 02	2 16	2 28
54	19 25	22 31	1 54	2 08	2 19	2 28
56	19 33	////	2 04	2 15	2 23	2 29
58	19 42	////	2 16	2 23	2 27	2 30
60	19 53	////	2 30	2 32	2 32	2 31
S						

GCT	Equation of Time (App.—Mean) 6	7	8
h	m s	m s	m s
0	+16 21.3	+16 19.2	+16 16.3
6	+16 20.8	+16 18.5	+16 15.4
12	+16 20.3	+16 17.8	+16 14.5
18	+16 19.8	+16 17.1	+16 13.6
24	+16 19.2	+16 16.3	+16 12.6

GCT of Transit Meridian of Greenwich DAY	Moon	Venus	Mars	Jupiter	Saturn
	h m	h m	h m	h m	h m
6	18 30	8 50	8 25	21 20	9 41
7	19 19	8 49	8 23	21 16	9 38
8	20 05	8 49	8 22	21 12	9 34
9	20 50	8 49	8 20	21 08	9 30

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb	Venus	Mars
°	′	′	′
0			
	0.5	0.2	0.1
30			
	0.5	0.2	0.1
45			
	0.5	0.1	0.0
60			
	0.5	0.1	0.0
75			
	0.5	0.0	0.0
90			

Moon's Lower Limb
Add

Alt.	6	7	8
°	′	′	′
0			
	18.0	17.3	16.7
4			
	18.0	17.3	16.7
8			
	17.9	17.3	16.7
12			
	17.9	17.3	16.7
16			
	17.9	17.3	16.7
20			
	17.8	17.2	16.6
24			
	17.8	17.2	16.6
28			
	17.7	17.1	16.6
32			
	17.6	17.1	16.5
36			
	17.6	17.0	16.5
40			
	17.5	17.0	16.5
44			
	17.4	16.9	16.4
48			
	17.3	16.8	16.4
52			
	17.2	16.8	16.3
56			
	17.1	16.7	16.3
60			
	17.0	16.6	16.2
64			
	16.8	16.5	16.2
68			
	16.7	16.4	16.1
72			
	16.6	16.3	16.0
76			
	16.5	16.2	16.0
80			
	16.3	16.1	15.9
84			
	16.2	16.0	15.9
88			
	16.1	16.0	15.8
90			

Add to table, back cover

Moon's Upper Limb
Subtract

Alt.	6	7	8
°	′	′	′
0			
	14.2	14.5	14.9
4			
	14.2	14.5	14.9
8			
	14.2	14.6	14.9
12			
	14.2	14.6	14.9
16			
	14.3	14.6	14.9
20			
	14.3	14.6	15.0
24			
	14.4	14.7	15.0
28			
	14.4	14.7	15.0
32			
	14.5	14.8	15.0
36			
	14.6	14.8	15.1
40			
	14.7	14.9	15.1
44			
	14.7	15.0	15.2
48			
	14.8	15.0	15.2
52			
	15.0	15.1	15.3
56			
	15.1	15.2	15.3
60			
	15.2	15.3	15.4
64			
	15.3	15.4	15.4
68			
	15.4	15.5	15.5
72			
	15.5	15.5	15.5
76			
	15.7	15.6	15.6
80			
	15.8	15.7	15.7
84			
	15.9	15.8	15.7
88			
	16.0	15.9	15.8
90			

Subtract from table, back cover

Election Day (in certain States) 6
First Quarter 6

G C T	♈ GHA	VENUS −4.1 GHA	VENUS Dec.	MARS 1.8 GHA	MARS Dec.	JUPITER −2.3 GHA	JUPITER Dec.	SATURN 1.1 GHA	SATURN Dec.	MOON GHA	code	MOON Dec.	code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
0	47 21.6	227 47.4	+ 0 55.1	234 55.2	+ 4 55.0	42 08.5	+ 0 33.9	217 02.7	− 2 02.7	56 54.2	138	− 2 54.9	+158
1	62 24.1	242 47.5	54.4	249 56.3	54.4	57 11.2	33.9	232 04.9	02.8	71 27.0	139	2 39.1	+158
2	77 26.5	257 47.7	53.6	264 57.4	53.8	72 13.8	33.8	247 07.1	02.9	85 59.9	138	2 23.3	+158
3	92 29.0	272 47.8	·· 52.9	279 58.5	·· 53.3	87 16.4	·· 33.8	262 09.3	·· 03.0	100 32.7	139	· 2 07.5	+157
4	107 31.5	287 48.0	52.1	294 59.6	52.7	102 19.1	33.7	277 11.5	03.1	115 05.6	140	1 51.8	+158
5	122 33.9	302 48.1	51.4	310 00.7	52.1	117 21.7	33.6	292 13.7	03.2	129 38.6	139	1 36.0	+158
6	137 36.4	317 48.3	+ 0 50.7	325 01.8	+ 4 51.6	132 24.3	+ 0 33.6	307 15.9	− 2 03.3	144 11.5	140	− 1 20.2	+158
7	152 38.9	332 48.4	49.9	340 02.9	51.0	147 26.9	33.5	322 18.2	03.4	158 44.5	140	1 04.4	+158
8	167 41.3	347 48.6	49.2	355 04.0	50.4	162 29.6	33.5	337 20.4	03.5	173 17.5	140	0 48.6	+157
9	182 43.8	2 48.7	·· 48.4	10 05.1	·· 49.8	177 32.2	·· 33.4	352 22.6	·· 03.6	187 50.5	141	· 0 32.9	+158
10	197 46.3	17 48.9	47.7	25 06.2	49.3	192 34.8	33.3	7 24.8	03.7	202 23.6	140	0 17.1	+158
11	212 48.7	32 49.0	47.0	40 07.3	48.7	207 37.5	33.3	22 27.0	03.8	216 56.6	141	− 0 01.3	+157
12	227 51.2	47 49.1	+ 0 46.2	55 08.4	+ 4 48.1	222 40.1	+ 0 33.2	37 29.2	− 2 03.9	231 29.7	141	+ 0 14.4	+157
13	242 53.6	62 49.3	45.5	70 09.5	47.6	237 42.7	33.2	52 31.4	04.0	246 02.8	141	0 30.1	+157
14	257 56.1	77 49.4	44.7	85 10.6	47.0	252 45.3	33.1	67 33.7	04.1	260 35.9	142	0 45.8	+158
15	272 58.6	92 49.6	·· 44.0	100 11.7	·· 46.4	267 48.0	·· 33.0	82 35.9	·· 04.2	275 09.1	141	· 1 01.6	+156
16	288 01.0	107 49.7	43.2	115 12.8	45.9	282 50.6	33.0	97 38.1	04.3	289 42.2	142	1 17.2	+157
17	303 03.5	122 49.9	42.5	130 13.9	45.3	297 53.2	32.9	112 40.3	04.4	304 15.4	141	1 32.9	+157
18	318 06.0	137 50.0	+ 0 41.7	145 15.0	+ 4 44.7	312 55.8	+ 0 32.9	127 42.5	− 2 04.5	318 48.5	142	+ 1 48.6	+156
19	333 08.4	152 50.1	41.0	160 16.1	44.2	327 58.5	32.8	142 44.7	04.6	333 21.7	142	2 04.2	+156
20	348 10.9	167 50.3	40.2	175 17.2	43.6	343 01.1	32.7	157 46.9	04.6	347 54.9	142	2 19.8	+156
21	3 13.4	182 50.4	·· 39.5	190 18.3	·· 43.0	358 03.7	·· 32.7	172 49.2	·· 04.7	2 28.1	142	· 2 35.4	+156
22	18 15.8	197 50.6	38.7	205 19.4	42.5	13 06.3	32.6	187 51.4	04.8	17 01.3	142	2 51.0	+156
23	33 18.3	212 50.7	38.0	220 20.5	41.9	28 09.0	32.6	202 53.6	04.9	31 34.5	142	3 06.6	+155
0	48 20.8	227 50.8	+ 0 37.2	235 21.6	+ 4 41.3	43 11.6	+ 0 32.5	217 55.8	− 2 05.0	46 07.7	142	+ 3 22.1	+155
1	63 23.2	242 51.0	36.5	250 22.7	40.8	58 14.2	32.5	232 58.0	05.1	60 40.9	143	3 37.6	+155
2	78 25.7	257 51.1	35.7	265 23.8	40.2	73 16.8	32.4	248 00.2	05.2	75 14.2	142	3 53.1	+154
3	93 28.1	272 51.2	·· 35.0	280 24.9	·· 39.6	88 19.5	·· 32.3	263 02.4	·· 05.3	89 47.4	142	· 4 08.5	+154
4	108 30.6	287 51.4	34.2	295 26.0	39.0	103 22.1	32.3	278 04.7	05.4	104 20.6	142	4 23.9	+154
5	123 33.1	302 51.5	33.5	310 27.1	38.5	118 24.7	32.2	293 06.9	05.5	118 53.8	142	4 39.3	+154
6	138 35.5	317 51.6	+ 0 32.7	325 28.2	+ 4 37.9	133 27.3	+ 0 32.2	308 09.1	− 2 05.6	133 27.0	142	+ 4 54.7	+153
7	153 38.0	332 51.8	31.9	340 29.3	37.3	148 29.9	32.1	323 11.3	05.7	148 00.2	142	5 10.0	+153
8	168 40.5	347 51.9	31.2	355 30.4	36.8	163 32.6	32.1	338 13.5	05.8	162 33.4	142	5 25.3	+153
9	183 42.9	2 52.0	·· 30.4	10 31.6	·· 36.2	178 35.2	·· 32.0	353 15.7	·· 05.9	177 06.6	142	· 5 40.6	+152
10	198 45.4	17 52.2	29.7	25 32.7	35.6	193 37.8	31.9	8 17.9	06.0	191 39.8	142	5 55.8	+152
11	213 47.9	32 52.3	28.9	40 33.8	35.1	208 40.4	31.9	23 20.2	06.1	206 13.0	142	6 11.0	+152
12	228 50.3	47 52.4	+ 0 28.1	55 34.9	+ 4 34.5	223 43.1	+ 0 31.8	38 22.4	− 2 06.2	220 46.2	142	+ 6 26.2	+151
13	243 52.8	62 52.6	27.4	70 36.0	33.9	238 45.7	31.8	53 24.6	06.3	235 19.4	141	6 41.3	+151
14	258 55.2	77 52.7	26.6	85 37.1	33.4	253 48.3	31.7	68 26.8	06.4	249 52.5	142	6 56.4	+150
15	273 57.7	92 52.8	·· 25.9	100 38.2	·· 32.8	268 50.9	·· 31.7	83 29.0	·· 06.5	264 25.7	141	· 7 11.4	+151
16	289 00.2	107 52.9	25.1	115 39.3	32.2	283 53.5	31.6	98 31.2	06.6	278 58.8	141	7 26.5	+149
17	304 02.6	122 53.1	24.3	130 40.4	31.7	298 56.1	31.6	113 33.4	06.7	293 31.9	141	7 41.4	+149
18	319 05.1	137 53.2	+ 0 23.6	145 41.5	+ 4 31.1	313 58.8	+ 0 31.5	128 35.7	− 2 06.8	308 05.0	141	+ 7 56.3	+149
19	334 07.6	152 53.3	22.8	160 42.6	30.5	329 01.4	31.4	143 37.9	06.9	322 38.1	140	8 11.2	+148
20	349 10.0	167 53.4	22.1	175 43.7	30.0	344 04.0	31.4	158 40.1	07.0	337 11.1	141	8 26.0	+148
21	4 12.5	182 53.6	·· 21.3	190 44.8	·· 29.4	359 06.6	·· 31.3	173 42.3	·· 07.1	351 44.2	140	· 8 40.8	+147
22	19 15.0	197 53.7	20.5	205 45.9	28.8	14 09.2	31.3	188 44.5	07.2	6 17.2	140	8 55.5	+147
23	34 17.4	212 53.8	19.8	220 47.0	28.3	29 11.9	31.2	203 46.7	07.3	20 50.2	140	9 10.2	+147
0	49 19.9	227 53.9	+ 0 19.0	235 48.1	+ 4 27.7	44 14.5	+ 0 31.2	218 49.0	− 2 07.4	35 23.2	139	+ 9 24.9	+146
1	64 22.4	242 54.1	18.2	250 49.2	27.1	59 17.1	31.1	233 51.2	07.5	49 56.1	140	9 39.5	+145
2	79 24.8	257 54.2	17.5	265 50.3	26.6	74 19.7	31.1	248 53.4	07.6	64 29.1	139	9 54.0	+145
3	94 27.3	272 54.3	·· 16.7	280 51.4	·· 26.0	89 22.3	·· 31.0	263 55.6	·· 07.7	79 02.0	139	·10 08.5	+144
4	109 29.7	287 54.4	15.9	295 52.5	25.4	104 24.9	30.9	278 57.8	07.8	93 34.9	138	10 22.9	+144
5	124 32.2	302 54.5	15.1	310 53.7	24.8	119 27.5	30.9	294 00.0	07.9	108 07.7	139	10 37.3	+143
6	139 34.7	317 54.6	+ 0 14.4	325 54.8	+ 4 24.3	134 30.2	+ 0 30.8	309 02.3	− 2 08.0	122 40.6	138	+10 51.6	+142
7	154 37.1	332 54.8	13.6	340 55.9	23.7	149 32.8	30.8	324 04.5	08.1	137 13.4	137	11 05.8	+142
8	169 39.6	347 54.9	12.8	355 57.0	23.1	164 35.4	30.7	339 06.7	08.2	151 46.1	138	11 20.0	+142
9	184 42.1	2 55.0	·· 12.1	10 58.1	·· 22.6	179 38.0	·· 30.7	354 08.9	·· 08.3	166 18.9	137	·11 34.2	+141
10	199 44.5	17 55.1	11.3	25 59.2	22.0	194 40.6	30.6	9 11.1	08.4	180 51.6	137	11 48.3	+140
11	214 47.0	32 55.2	10.5	41 00.3	21.4	209 43.2	30.6	24 13.3	08.5	195 24.3	136	12 02.3	+139
12	229 49.5	47 55.3	+ 0 09.7	56 01.4	+ 4 20.9	224 45.8	+ 0 30.5	39 15.6	− 2 08.6	209 56.9	136	+12 16.2	+139
13	244 51.9	62 55.4	09.0	71 02.5	20.3	239 48.5	30.5	54 17.8	08.7	224 29.5	136	12 30.1	+139
14	259 54.4	77 55.6	08.2	86 03.6	19.7	254 51.1	30.4	69 20.0	08.8	239 02.1	136	12 44.0	+137
15	274 56.8	92 55.7	·· 07.4	101 04.7	·· 19.2	269 53.7	·· 30.4	84 22.2	·· 08.9	253 34.7	135	·12 57.7	+137
16	289 59.3	107 55.8	06.6	116 05.8	18.6	284 56.3	30.3	99 24.4	09.0	268 07.2	135	13 11.4	+137
17	305 01.8	122 55.9	05.9	131 06.9	18.0	299 58.9	30.3	114 26.6	09.1	282 39.7	134	13 25.1	+135
18	320 04.2	137 56.0	+ 0 05.1	146 08.0	+ 4 17.5	315 01.5	+ 0 30.2	129 28.9	− 2 09.2	297 12.1	134	+13 38.6	+135
19	335 06.7	152 56.1	04.3	161 09.2	16.9	330 04.1	30.2	144 31.1	09.3	311 44.5	134	13 52.1	+134
20	350 09.2	167 56.2	03.5	176 10.3	16.3	345 06.7	30.1	159 33.3	09.4	326 16.9	133	14 05.5	+134
21	5 11.6	182 56.3	·· 02.8	191 11.4	·· 15.8	0 09.4	·· 30.1	174 35.5	·· 09.5	340 49.2	133	·14 18.9	+133
22	20 14.1	197 56.4	02.0	206 12.5	15.2	15 12.0	30.0	189 37.7	09.6	355 21.5	132	14 32.2	+132
23	35 16.6	212 56.5	01.2	221 13.6	14.6	30 14.6	29.9	204 39.9	09.7	9 53.7	132	14 45.4	+131
24	50 19.0	227 56.6	+ 0 00.4	236 14.7	+ 4 14.1	45 17.2	+ 0 29.9	219 42.2	− 2 09.8	24 25.9	132	+14 58.5	+131
code	—	+ 2	− 7	+ 11	− 6	+ 26	0	+ 22	− 1				

SUN

GCT (h)	GHA (° ′)	Dec. (° ′)
0	184 03.1	−16 34.1
1	199 03.1	34.8
2	214 03.0	35.5
3	229 03.0	36.2
4	244 02.9	37.0
5	259 02.9	37.7
6	274 02.9	−16 38.4
7	289 02.8	39.1
8	304 02.8	39.9
9	319 02.7	40.6
10	334 02.7	41.3
11	349 02.6	42.0
12	4 02.6	−16 42.8
13	19 02.5	43.5
14	34 02.5	44.2
15	49 02.4	44.9
16	64 02.4	45.6
17	79 02.3	46.4
18	94 02.3	−16 47.1
19	109 02.2	47.8
20	124 02.2	48.5
21	139 02.1	49.2
22	154 02.1	49.9
23	169 02.0	50.7
0	184 02.0	−16 51.4
1	199 01.9	52.1
2	214 01.9	52.8
3	229 01.8	53.5
4	244 01.8	54.2
5	259 01.7	54.9
6	274 01.7	−16 55.6
7	289 01.6	56.4
8	304 01.6	57.1
9	319 01.5	57.8
10	334 01.4	58.5
11	349 01.4	59.2
12	4 01.3	−16 59.9
13	19 01.3	17 00.6
14	34 01.2	01.3
15	49 01.2	02.0
16	64 01.1	02.7
17	79 01.0	03.5
18	94 01.0	−17 04.2
19	109 00.9	04.9
20	124 00.9	05.6
21	139 00.8	06.3
22	154 00.8	07.0
23	169 00.7	07.7
0	184 00.6	−17 08.4
1	199 00.6	09.1
2	214 00.5	09.8
3	229 00.4	10.5
4	244 00.4	11.2
5	259 00.3	11.9
6	274 00.3	−17 12.6
7	289 00.2	13.3
8	304 00.1	14.0
9	319 00.1	14.7
10	334 00.0	15.4
11	348 59.9	16.1
12	3 59.9	−17 16.8
13	18 59.8	17.5
14	33 59.7	18.2
15	48 59.7	18.9
16	63 59.6	19.6
17	78 59.5	20.3
18	93 59.5	−17 21.0
19	108 59.4	21.6
20	123 59.3	22.3
21	138 59.3	23.0
22	153 59.2	23.7
23	168 59.1	24.4
24	183 59.1	−17 25.1
code	—	− 7

STARS

No.	SHA (° ′)	Dec. (° ′)	Transit Mer. Gr. (h m)
1	358 31.3	+28 49.7	20 49
2	358 20.8	+58 53.4	20 50
3	349 42.0	−18 14.9	21 24
4	339 19.8	+59 59.4	22 06
5	336 00.3	−57 28.8	22 19
6	332 17.5	+89 02.5	22 34
7	328 52.8	+23 14.4	22 47
8	315 52.9	−40 29.6	23 39
9	309 46.4	+49 41.7	0 08
10	291 42.3	+16 25.0	1 20
11	281 56.3	− 8 15.1	1 59
12	281 42.6	+45 57.2	1 59
13	279 21.4	+ 6 18.7	2 09
14	279 10.9	+28 34.3	2 10
15	276 33.1	− 1 13.6	2 20
16	271 51.2	+ 7 24.2	2 39
17	264 16.4	−52 39.7	3 09
18	259 14.3	−16 38.6	3 29
19	255 48.7	−28 54.0	3 43
20	245 48.0	+ 5 21.2	4 23
21	244 24.1	+28 08.7	4 28
22	234 37.0	−59 20.8	5 07
23	223 26.7	−43 13.9	5 52
24	221 50.0	−69 30.7	5 58
25	218 41.6	− 8 26.7	6 11
26	208 32.8	+12 12.3	6 51
27	194 48.4	+62 00.5	7 46
28	183 21.0	+14 50.5	8 32
29	174 02.1	−62 49.8	9 09
30	172 53.3	−56 50.4	9 14
31	168 47.3	−59 25.4	9 30
32	167 01.5	+56 13.1	9 37
33	159 30.4	+55 10.4	10 07
34	159 20.4	−10 54.6	10 08
35	153 35.6	+49 33.0	10 31
36	149 02.8	−36 08.0	10 49
37	146 38.3	+19 25.9	10 58
38	140 56.1	−60 38.4	11 21
39	137 18.5	+74 21.0	11 35
40	126 50.5	+26 52.5	12 17
41	120 38.1	−22 29.2	12 42
42	113 23.5	−26 19.7	13 11
43	109 07.6	−68 56.8	13 28
44	103 06.0	−15 40.1	13 52
45	97 25.2	−37 04.4	14 15
46	96 49.7	+12 35.6	14 17
47	91 08.1	+51 29.7	14 40
48	84 45.5	−34 24.8	15 05
49	81 10.6	+38 44.4	15 19
50	76 55.9	−26 21.7	15 36
51	62 53.6	+ 8 44.4	16 32
52	54 32.1	−56 53.8	17 06
53	50 03.3	+45 06.7	17 24
54	34 32.6	+ 9 39.3	18 25
55	28 41.5	−47 11.9	18 49
56	16 14.8	−29 52.7	19 38
57	14 24.4	+14 56.9	19 46

Lat.	Sunrise	Twlt. begins	Moonrise 9	Moonrise 10	Moonrise 11	Moonrise 12
N °	h m	h m	h m	h m	h m	h m
70	9 15	5 17	14 30	14 04	13 33	12 45
68	8 47	5 16	14 31	14 12	13 50	13 19
66	8 26	5 17	14 32	14 18	14 03	13 44
64	8 09	5 16	14 32	14 24	14 15	14 04
62	7 55	5 15	14 33	14 29	14 24	14 20
60	7 43	5 15	14 33	14 33	14 33	14 34
58	7 33	5 14	14 34	14 37	14 40	14 45
56	7 25	5 13	14 34	14 40	14 47	14 55
54	7 17	5 13	14 35	14 43	14 53	15 05
52	7 10	5 12	14 35	14 46	14 58	15 13
50	7 03	5 11	14 35	14 48	15 03	15 20
45	6 50	5 07	14 36	14 54	15 13	15 35
40	6 38	5 04	14 36	14 59	15 22	15 48
35	6 29	5 01	14 37	15 03	15 30	15 59
30	6 20	4 58	14 37	15 06	15 37	16 09
20	6 06	4 50	14 38	15 13	15 48	16 26
10	5 53	4 40	14 39	15 18	15 58	16 41
0	5 40	4 28	14 39	15 24	16 08	16 55
10	5 28	4 14	14 40	15 29	16 18	17 09
20	5 15	3 56	14 41	15 35	16 29	17 24
30	4 59	3 31	14 42	15 41	16 41	17 41
35	4 50	3 15	14 42	15 45	16 48	17 51
40	4 40	2 55	14 43	15 49	16 56	18 03
45	4 28	2 27	14 43	15 55	17 06	18 17
50	4 13	1 45	14 44	16 01	17 17	18 34
52	4 06	1 21	14 45	16 04	17 23	18 42
54	3 58	0 44	14 45	16 07	17 29	18 51
56	3 49	////	14 46	16 10	17 35	19 01
58	3 40	////	14 46	16 14	17 43	19 12
60	3 28	////	14 47	16 19	17 51	19 26
S						

Lat.	Sunset	Twlt. ends	Moonset 9	Moonset 10	Moonset 11	Moonset 12
N °	h m	h m	h m	h m	h m	h m
70	14 12	18 07	1 47	3 49	5 54	8 18
68	14 40	18 07	1 50	3 44	5 40	7 45
66	15 01	18 08	1 53	3 40	5 28	7 22
64	15 18	18 09	1 55	3 36	5 18	7 04
62	15 32	18 09	1 57	3 33	5 10	6 49
60	15 44	18 11	1 58	3 30	5 03	6 36
58	15 54	18 11	2 00	3 28	4 56	6 25
56	16 03	18 12	2 01	3 26	4 51	6 16
54	16 10	18 13	2 02	3 24	4 46	6 08
52	16 18	18 15	2 03	3 22	4 41	6 00
50	16 24	18 15	2 04	3 21	4 37	5 54
45	16 38	18 19	2 06	3 18	4 29	5 40
40	16 49	18 22	2 08	3 15	4 21	5 28
35	16 59	18 26	2 09	3 12	4 15	5 18
30	17 07	18 29	2 10	3 10	4 10	5 10
20	17 22	18 38	2 12	3 07	4 00	4 55
10	17 35	18 48	2 14	3 03	3 52	4 42
0	17 47	18 59	2 16	3 00	3 45	4 30
10	18 00	19 14	2 18	2 57	3 37	4 18
20	18 13	19 32	2 19	2 54	3 29	4 06
30	18 29	19 58	2 21	2 50	3 20	3 51
35	18 38	20 14	2 23	2 48	3 15	3 43
40	18 48	20 35	2 24	2 46	3 09	3 33
45	19 01	21 04	2 25	2 43	3 02	3 23
50	19 16	21 46	2 27	2 40	2 54	3 09
52	19 23	22 12	2 28	2 39	2 50	3 03
54	19 31	22 54	2 28	2 37	2 46	2 56
56	19 40	////	2 29	2 35	2 41	2 49
58	19 50	////	2 30	2 33	2 36	2 40
60	20 01	////	2 31	2 31	2 31	2 31
S						

Equation of Time (App.—Mean)

GCT (h)	9 (m s)	10 (m s)	11 (m s)
0	+16 12.6	+16 08.0	+16 02.7
6	+16 11.5	+16 06.8	+16 01.2
12	+16 10.4	+16 05.4	+15 59.7
18	+16 09.2	+16 04.1	+15 58.1
24	+16 08.0	+16 02.7	+15 56.4

GCT of Transit Meridian of Greenwich

DAY	Moon (h m)	Venus (h m)	Mars (h m)	Jupiter (h m)	Saturn (h m)
9	20 50	8 49	8 20	21 08	9 30
10	21 34	8 49	8 18	21 04	9 27
11	22 19	8 48	8 16	20 59	9 23
12	23 06	8 48	8 14	20 55	9 20

ADDITIONAL ALTITUDE CORRECTIONS

Alt. °	Sun's Low'r Limb ′	Venus ′	Mars ′
0			
	0.5	0.2	0.1
30			
	0.5	0.2	0.1
45			
	0.5	0.1	0.0
60			
	0.5	0.1	0.0
75			
	0.5	0.0	0.0
90			

Moon's Lower Limb

Add

Alt. °	9 ′	10 ′	11 ′
0			
	16.1	15.4	14.8
4			
	16.1	15.4	14.8
8			
	16.1	15.4	14.8
12			
	16.0	15.4	14.8
16			
	16.0	15.4	14.8
20			
	16.0	15.4	14.8
24			
	16.0	15.4	14.8
28			
	16.0	15.4	14.9
32			
	16.0	15.4	14.9
36			
	16.0	15.4	14.9
40			
	16.0	15.4	14.9
44			
	15.9	15.5	15.0
48			
	15.9	15.5	15.0
52			
	15.9	15.5	15.0
56			
	15.9	15.5	15.1
60			
	15.8	15.5	15.1
64			
	15.8	15.5	15.1
68			
	15.8	15.5	15.2
72			
	15.8	15.5	15.2
76			
	15.7	15.5	15.3
80			
	15.7	15.5	15.3
84			
	15.7	15.5	15.3
88			
	15.7	15.5	15.4
90			

Add to table, back cover

Moon's Upper Limb

Subtract

Alt. °	9 ′	10 ′	11 ′
0			
	15.3	15.6	16.0
4			
	15.3	15.6	16.0
8			
	15.3	15.6	16.0
12			
	15.3	15.6	16.0
16			
	15.3	15.6	16.0
20			
	15.3	15.6	15.9
24			
	15.3	15.6	15.9
28			
	15.3	15.6	15.9
32			
	15.3	15.6	15.9
36			
	15.3	15.6	15.9
40			
	15.4	15.6	15.8
44			
	15.4	15.6	15.8
48			
	15.4	15.6	15.8
52			
	15.4	15.6	15.7
56			
	15.4	15.6	15.7
60			
	15.5	15.6	15.7
64			
	15.5	15.6	15.6
68			
	15.5	15.6	15.6
72			
	15.5	15.6	15.6
76			
	15.6	15.5	15.5
80			
	15.6	15.5	15.5
84			
	15.6	15.5	15.4
88			
	15.7	15.5	15.4
90			

Subtract from table, back cover

Armistice Day 11

GCT	♈	VENUS −4.0		MARS 1.8		JUPITER −2.3		SATURN 1.1		MOON			
	GHA	GHA	Dec.	GHA	Dec.	GHA	Dec.	GHA	Dec.	GHA	code	Dec.	code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
0	50 19.0	227 56.6	+ 0 00.4	236 14.7	+ 4 14.1	45 17.2	+ 0 29.9	219 42.2	− 2 09.8	24 25.9	132	+14 58.5	+131
1	65 21.5	242 56.7	− 0 00.4	251 15.8	13.5	60 19.8	29.8	234 44.4	09.9	38 58.1	131	15 11.6	+129
2	80 24.0	257 56.8	01.1	266 16.9	12.9	75 22.4	29.8	249 46.6	10.0	53 30.2	131	15 24.5	+129
3	95 26.4	272 56.9	·· 01.9	281 18.0	·· 12.4	90 25.0	·· 29.7	264 48.8	·· 10.1	68 02.3	130	·15 37.4	+129
4	110 28.9	287 57.0	02.7	296 19.1	11.8	105 27.6	29.7	279 51.0	10.2	82 34.3	130	15 50.3	+127
5	125 31.3	302 57.2	03.5	311 20.2	11.2	120 30.2	29.6	294 53.3	10.3	97 06.3	129	16 03.0	+127
6	140 33.8	317 57.3	− 0 04.3	326 21.4	+ 4 10.7	135 32.8	+ 0 29.6	309 55.5	− 2 10.4	111 38.2	129	+16 15.7	+126
7	155 36.3	332 57.4	05.1	341 22.5	10.1	150 35.4	29.5	324 57.7	10.4	126 10.1	129	16 28.3	+124
8	170 38.7	347 57.5	05.8	356 23.6	09.5	165 38.0	29.5	339 59.9	10.5	140 42.0	128	16 40.7	+125
9	185 41.2	2 57.6	·· 06.6	11 24.7	·· 08.9	180 40.6	·· 29.4	355 02.1	·· 10.6	155 13.8	127	·16 53.2	+123
10	200 43.7	17 57.7	07.4	26 25.8	08.4	195 43.3	29.4	10 04.4	10.7	169 45.5	128	17 05.5	+122
11	215 46.1	32 57.7	08.2	41 26.9	07.8	210 45.9	29.3	25 06.6	10.8	184 17.3	126	17 17.7	+122
12	230 48.6	47 57.8	− 0 09.0	56 28.0	+ 4 07.2	225 48.5	+ 0 29.3	40 08.8	− 2 10.9	198 48.9	126	+17 29.9	+121
13	245 51.1	62 57.9	09.8	71 29.1	06.7	240 51.1	29.2	55 11.0	11.0	213 20.5	126	17 42.0	+119
14	260 53.5	77 58.0	10.6	86 30.2	06.1	255 53.7	29.2	70 13.2	11.1	227 52.1	125	17 53.9	+119
15	275 56.0	92 58.1	·· 11.4	101 31.3	·· 05.5	270 56.3	·· 29.1	85 15.4	·· 11.2	242 23.6	125	·18 05.8	+118
16	290 58.5	107 58.2	12.1	116 32.5	05.0	285 58.9	29.1	100 17.7	11.3	256 55.1	124	18 17.6	+117
17	306 00.9	122 58.3	12.9	131 33.6	04.4	301 01.5	29.0	115 19.9	11.4	271 26.5	124	18 29.3	+116
18	321 03.4	137 58.4	− 0 13.7	146 34.7	+ 4 03.8	316 04.1	+ 0 29.0	130 22.1	− 2 11.5	285 57.9	123	+18 40.9	+116
19	336 05.8	152 58.5	14.5	161 35.8	03.3	331 06.7	28.9	145 24.3	11.6	300 29.2	123	18 52.5	+114
20	351 08.3	167 58.6	15.3	176 36.9	02.7	346 09.3	28.9	160 26.5	11.7	315 00.5	122	19 03.9	+113
21	6 10.8	182 58.7	·· 16.1	191 38.0	·· 02.1	1 11.9	·· 28.9	175 28.8	·· 11.8	329 31.7	122	·19 15.2	+113
22	21 13.2	197 58.8	16.9	206 39.1	01.6	16 14.5	28.8	190 31.0	11.9	344 02.9	121	19 26.5	+111
23	36 15.7	212 58.9	17.7	221 40.2	01.0	31 17.1	28.8	205 33.2	12.0	358 34.0	120	19 37.6	+110
0	51 18.2	227 59.0	− 0 18.5	236 41.3	+ 4 00.4	46 19.7	+ 0 28.7	220 35.4	− 2 12.1	13 05.0	120	+19 48.6	+110
1	66 20.6	242 59.1	19.3	251 42.5	3 59.9	61 22.3	28.7	235 37.6	12.2	27 36.0	120	19 59.6	+108
2	81 23.1	257 59.1	20.1	266 43.6	59.3	76 24.9	28.6	250 39.9	12.3	42 07.0	119	20 10.4	+107
3	96 25.6	272 59.2	·· 20.9	281 44.7	·· 58.7	91 27.5	·· 28.6	265 42.1	·· 12.4	56 37.9	119	·20 21.1	+107
4	111 28.0	287 59.3	21.7	296 45.8	58.2	106 30.1	28.5	280 44.3	12.5	71 08.8	118	20 31.8	+105
5	126 30.5	302 59.4	22.5	311 46.9	57.6	121 32.7	28.5	295 46.5	12.6	85 39.6	117	20 42.3	+104
6	141 32.9	317 59.5	− 0 23.2	326 48.0	+ 3 57.0	136 35.3	+ 0 28.4	310 48.7	− 2 12.7	100 10.3	117	+20 52.7	+104
7	156 35.4	332 59.6	24.0	341 49.1	56.5	151 37.9	28.4	325 51.0	12.8	114 41.0	117	21 03.1	+102
8	171 37.9	347 59.7	24.8	356 50.2	55.9	166 40.5	28.3	340 53.2	12.9	129 11.7	116	21 13.3	+101
9	186 40.3	2 59.7	·· 25.6	11 51.3	·· 55.3	181 43.1	·· 28.3	355 55.4	·· 13.0	143 42.3	115	·21 23.4	+100
10	201 42.8	17 59.8	26.4	26 52.5	54.8	196 45.7	28.2	10 57.6	13.1	158 12.8	115	21 33.4	+ 99
11	216 45.3	32 59.9	27.2	41 53.6	54.2	211 48.3	28.2	25 59.8	13.2	172 43.3	115	21 43.3	+ 98
12	231 47.7	48 00.0	− 0 28.0	56 54.7	+ 3 53.6	226 50.9	+ 0 28.1	41 02.1	− 2 13.2	187 13.8	114	+21 53.1	+ 97
13	246 50.2	63 00.1	28.8	71 55.8	53.1	241 53.5	28.1	56 04.3	13.3	201 44.2	113	22 02.8	+ 95
14	261 52.7	78 00.2	29.6	86 56.9	52.5	256 56.1	28.0	71 06.5	13.4	216 14.5	113	22 12.3	+ 95
15	276 55.1	93 00.2	·· 30.4	101 58.0	·· 51.9	271 58.7	·· 28.0	86 08.7	·· 13.5	230 44.8	112	·22 21.8	+ 93
16	291 57.6	108 00.3	31.2	116 59.1	51.4	287 01.3	28.0	101 10.9	13.6	245 15.0	112	22 31.1	+ 92
17	307 00.1	123 00.4	32.1	132 00.2	50.8	302 03.9	27.9	116 13.2	13.7	259 45.2	112	22 40.3	+ 91
18	322 02.5	138 00.5	− 0 32.9	147 01.4	+ 3 50.2	317 06.5	+ 0 27.9	131 15.4	− 2 13.8	274 15.4	110	+22 49.4	+ 90
19	337 05.0	153 00.6	33.7	162 02.5	49.7	332 09.1	27.8	146 17.6	13.9	288 45.4	111	22 58.4	+ 89
20	352 07.4	168 00.6	34.5	177 03.6	49.1	347 11.7	27.8	161 19.8	14.0	303 15.5	110	23 07.3	+ 88
21	7 09.9	183 00.7	·· 35.3	192 04.7	·· 48.5	2 14.3	·· 27.7	176 22.1	·· 14.1	317 45.5	109	·23 16.1	+ 86
22	22 12.4	198 00.8	36.1	207 05.8	48.0	17 16.9	27.7	191 24.3	14.2	332 15.4	109	23 24.7	+ 86
23	37 14.8	213 00.9	36.9	222 06.9	47.4	32 19.5	27.6	206 26.5	14.3	346 45.3	108	23 33.3	+ 84
0	52 17.3	228 00.9	− 0 37.7	237 08.0	+ 3 46.8	47 22.1	+ 0 27.6	221 28.7	− 2 14.4	1 15.1	108	+23 41.7	+ 82
1	67 19.8	243 01.0	38.5	252 09.2	46.3	62 24.7	27.6	236 30.9	14.5	15 44.9	108	23 49.9	+ 82
2	82 22.2	258 01.1	39.3	267 10.3	45.7	77 27.3	27.5	251 33.2	14.6	30 14.7	107	23 58.1	+ 81
3	97 24.7	273 01.2	·· 40.1	282 11.4	·· 45.1	92 29.9	·· 27.5	266 35.4	·· 14.7	44 44.4	106	·24 06.2	+ 79
4	112 27.2	288 01.2	40.9	297 12.5	44.6	107 32.5	27.4	281 37.6	14.8	59 14.0	106	24 14.1	+ 78
5	127 29.6	303 01.3	41.7	312 13.6	44.0	122 35.1	27.4	296 39.8	14.9	73 43.6	106	24 21.9	+ 77
6	142 32.1	318 01.4	− 0 42.5	327 14.7	+ 3 43.4	137 37.6	+ 0 27.3	311 42.1	− 2 15.0	88 13.2	105	+24 29.6	+ 75
7	157 34.6	333 01.4	43.3	342 15.8	42.9	152 40.2	27.3	326 44.3	15.1	102 42.7	105	24 37.1	+ 74
8	172 37.0	348 01.5	44.2	357 17.0	42.3	167 42.8	27.2	341 46.5	15.2	117 12.2	104	24 44.5	+ 73
9	187 39.5	3 01.6	·· 45.0	12 18.1	·· 41.7	182 45.4	·· 27.2	356 48.7	·· 15.3	131 41.6	104	·24 51.8	+ 72
10	202 41.9	18 01.6	45.8	27 19.2	41.2	197 48.0	27.2	11 50.9	15.4	146 11.0	103	24 59.0	+ 71
11	217 44.4	33 01.7	46.6	42 20.3	40.6	212 50.6	27.1	26 53.2	15.4	160 40.3	103	25 06.1	+ 69
12	232 46.9	48 01.8	− 0 47.4	57 21.4	+ 3 40.0	227 53.2	+ 0 27.1	41 55.4	− 2 15.5	175 09.6	103	+25 13.0	+ 68
13	247 49.3	63 01.8	48.2	72 22.5	39.5	242 55.8	27.0	56 57.6	15.6	189 38.9	102	25 19.8	+ 66
14	262 51.8	78 01.9	49.0	87 23.7	38.9	257 58.4	27.0	71 59.8	15.7	204 08.1	101	25 26.4	+ 66
15	277 54.3	93 02.0	·· 49.8	102 24.8	·· 38.3	273 01.0	·· 26.9	87 02.1	·· 15.8	218 37.2	102	·25 33.0	+ 64
16	292 56.7	108 02.0	50.7	117 25.9	37.8	288 03.6	26.9	102 04.3	15.9	233 06.4	101	25 39.4	+ 62
17	307 59.2	123 02.1	51.5	132 27.0	37.2	303 06.1	26.9	117 06.5	16.0	247 35.5	100	25 45.6	+ 62
18	323 01.7	138 02.2	− 0 52.3	147 28.1	+ 3 36.6	318 08.7	+ 0 26.8	132 08.7	− 2 16.1	262 04.5	101	+25 51.8	+ 60
19	338 04.1	153 02.2	53.1	162 29.2	36.1	333 11.3	26.8	147 10.9	16.2	276 33.6	100	25 57.8	+ 59
20	353 06.6	168 02.3	53.9	177 30.4	35.5	348 13.9	26.7	162 13.2	16.3	291 02.6	99	26 03.7	+ 57
21	8 09.1	183 02.4	·· 54.7	192 31.5	·· 34.9	3 16.5	·· 26.7	177 15.4	·· 16.4	305 31.5	99	·26 09.4	+ 56
22	23 11.5	198 02.4	55.6	207 32.6	34.4	18 19.1	26.6	192 17.6	16.5	320 00.4	99	26 15.0	+ 55
23	38 14.0	213 02.5	56.4	222 33.7	33.8	33 21.7	26.6	207 19.8	16.6	334 29.3	99	26 20.5	+ 53
24	53 16.4	228 02.5	− 0 57.2	237 34.8	+ 3 33.2	48 24.3	+ 0 26.6	222 22.1	− 2 16.7	348 58.2	98	+26 25.8	+ 52
code	—	+ 1	− 8	+ 11	− 5	+ 26	0	+ 22	− 1				

GCT	SUN GHA	SUN Dec.
h	° ′	° ′
0	183 59.1	−17 25.1
1	198 59.0	25.8
2	213 58.9	26.5
3	228 58.9	·· 27.2
4	243 58.8	27.9
5	258 58.7	28.6
6	273 58.7	−17 29.2
7	288 58.6	29.9
8	303 58.5	30.6
9	318 58.4	·· 31.3
10	333 58.4	32.0
11	348 58.3	32.7
12	3 58.2	−17 33.4
13	18 58.1	34.0
14	33 58.1	34.7
15	48 58.0	·· 35.4
16	63 57.9	36.1
17	78 57.8	36.8
18	93 57.8	−17 37.5
19	108 57.7	38.1
20	123 57.6	38.8
21	138 57.5	·· 39.5
22	153 57.5	40.2
23	168 57.4	40.9
0	183 57.3	−17 41.5
1	198 57.2	42.2
2	213 57.1	42.9
3	228 57.1	·· 43.6
4	243 57.0	44.2
5	258 56.9	44.9
6	273 56.8	−17 45.6
7	288 56.8	46.3
8	303 56.7	46.9
9	318 56.6	·· 47.6
10	333 56.5	48.3
11	348 56.4	49.0
12	3 56.3	−17 49.6
13	18 56.3	50.3
14	33 56.2	51.0
15	48 56.1	·· 51.6
16	63 56.0	52.3
17	78 55.9	53.0
18	93 55.8	−17 53.6
19	108 55.8	54.3
20	123 55.7	55.0
21	138 55.6	·· 55.7
22	153 55.5	56.3
23	168 55.4	57.0
0	183 55.3	−17 57.6
1	198 55.2	58.3
2	213 55.2	59.0
3	228 55.1	·17 59.6
4	243 55.0	18 00.3
5	258 54.9	01.0
6	273 54.8	−18 01.6
7	288 54.7	02.3
8	303 54.6	03.0
9	318 54.5	·· 03.6
10	333 54.4	04.3
11	348 54.4	04.9
12	3 54.3	−18 05.6
13	18 54.2	06.2
14	33 54.1	06.9
15	48 54.0	·· 07.6
16	63 53.9	08.2
17	78 53.8	08.9
18	93 53.7	−18 09.5
19	108 53.6	10.2
20	123 53.5	10.8
21	138 53.4	·· 11.5
22	153 53.3	12.1
23	168 53.2	12.8
24	183 53.1	−18 13.5
code	—	− 7

STARS No.	SHA	Dec.	Transit Mer. Gr.
	° ′	° ′	h m
1	358 31.3	+28 49.7	20 37
2	358 20.8	+58 53.4	20 38
3	349 42.0	−18 15.0	21 13
4	339 19.8	+59 59.4	21 54
5	336 00.3	−57 28.8	22 07
6	332 17.7	+89 02.5	22 22
7	328 52.8	+23 14.4	22 36
8	315 52.9	−40 29.6	23 27
9	309 46.4	+49 41.7	23 52
10	291 42.3	+16 25.0	1 08
11	281 56.3	− 8 15.1	1 47
12	281 42.5	+45 57.2	1 48
13	279 21.4	+ 6 18.7	1 57
14	279 10.9	+28 34.3	1 58
15	276 33.1	− 1 13.6	2 08
16	271 51.2	+ 7 24.2	2 27
17	264 16.3	−52 39.7	2 57
18	259 14.3	−16 38.6	3 17
19	255 48.7	−28 54.0	3 31
20	245 48.0	+ 5 21.1	4 11
21	244 24.1	+28 08.7	4 16
22	234 37.0	−59 20.8	4 56
23	223 26.6	−43 13.9	5 40
24	221 50.0	−69 30.7	5 47
25	218 41.6	− 8 26.8	5 59
26	208 32.8	+12 12.2	6 40
27	194 48.3	+62 00.4	7 34
28	183 21.0	+14 50.5	8 20
29	174 02.0	−62 49.8	8 57
30	172 53.3	−56 50.4	9 02
31	168 47.2	−59 25.4	9 18
32	167 01.4	+56 13.1	9 25
33	159 30.4	+55 10.4	9 55
34	159 20.4	−10 54.6	9 56
35	153 35.6	+49 33.0	10 19
36	149 02.8	−36 08.0	10 37
37	146 38.3	+19 25.9	10 46
38	140 56.1	−60 38.4	11 09
39	137 18.5	+74 21.0	11 24
40	126 50.5	+26 52.5	12 05
41	120 38.1	−22 29.2	12 30
42	113 23.5	−26 19.7	12 59
43	109 07.6	−68 56.7	13 16
44	103 06.0	−15 40.1	13 40
45	97 25.2	−37 04.4	14 03
46	96 49.7	+12 35.6	14 05
47	91 08.1	+51 29.7	14 28
48	84 45.5	−34 24.8	14 53
49	81 10.6	+38 44.4	15 08
50	76 55.9	−26 21.7	15 25
51	62 53.6	+ 8 44.4	16 21
52	54 32.1	−56 53.8	16 54
53	50 03.3	+45 06.7	17 12
54	34 32.6	+ 9 39.3	18 14
55	28 41.6	−47 11.9	18 37
56	16 14.8	−29 52.8	19 27
57	14 24.4	+14 56.9	19 34

Lat.	Sunrise	Twlt. begins	Moonrise 12	13	14	15
N °	h m	h m	h m	h m	h m	h m
70	9 32	5 26	12 45	□	□	□
68	9 00	5 25	13 19	12 04	□	□
66	8 37	5 24	13 44	13 14	□	□
64	8 19	5 23	14 04	13 50	13 21	□
62	8 04	5 22	14 20	14 16	14 12	14 07
60	7 51	5 21	14 34	14 37	14 43	15 00
58	7 40	5 20	14 45	14 54	15 07	15 32
56	7 31	5 19	14 55	15 08	15 27	15 56
54	7 23	5 18	15 05	15 20	15 43	16 16
52	7 15	5 16	15 13	15 31	15 57	16 32
50	7 08	5 15	15 20	15 41	16 09	16 46
45	6 54	5 12	15 35	16 02	16 34	17 15
40	6 42	5 08	15 48	16 19	16 55	17 37
35	6 32	5 04	15 59	16 33	17 12	17 56
30	6 23	5 00	16 09	16 45	17 26	18 12
20	6 07	4 51	16 26	17 07	17 51	18 40
10	5 54	4 40	16 41	17 25	18 13	19 03
0	5 41	4 29	16 55	17 43	18 33	19 25
10	5 28	4 14	17 09	18 00	18 54	19 47
20	5 14	3 55	17 24	18 20	19 16	20 11
30	4 57	3 29	17 41	18 41	19 41	20 39
35	4 48	3 12	17 51	18 54	19 56	20 55
40	4 37	2 50	18 03	19 09	20 14	21 14
45	4 24	2 20	18 17	19 27	20 35	21 37
50	4 09	1 36	18 34	19 50	21 02	22 07
52	4 01	1 08	18 42	20 00	21 15	22 22
54	3 53	0 16	18 51	20 13	21 31	22 39
56	3 44	////	19 01	20 27	21 49	23 00
58	3 33	////	19 12	20 43	22 10	23 26
60	3 21	////	19 26	21 03	22 39	24 02
S						

Lat.	Sunset	Twlt. ends	Moonset 12	13	14	15
N °	h m	h m	h m	h m	h m	h m
70	13 55	17 58	8 18	□	□	□
68	14 27	17 59	7 45	10 42	□	□
66	14 51	18 01	7 22	9 32	□	□
64	15 09	18 02	7 04	8 57	11 10	□
62	15 24	18 03	6 49	8 32	10 20	12 12
60	15 37	18 05	6 36	8 12	9 48	11 19
58	15 47	18 06	6 25	7 56	9 25	10 47
56	15 57	18 08	6 16	7 42	9 06	10 23
54	16 05	18 09	6 08	7 30	8 50	10 04
52	16 13	18 11	6 00	7 20	8 37	9 48
50	16 20	18 12	5 54	7 10	8 25	9 34
45	16 34	18 15	5 40	6 51	8 00	9 06
40	16 46	18 19	5 28	6 35	7 41	8 43
35	16 56	18 23	5 18	6 22	7 24	8 25
30	17 05	18 27	5 10	6 10	7 10	8 09
20	17 21	18 37	4 55	5 50	6 47	7 43
10	17 35	18 48	4 42	5 33	6 26	7 20
0	17 48	19 00	4 30	5 17	6 07	6 58
10	18 01	19 15	4 18	5 02	5 48	6 37
20	18 15	19 35	4 06	4 45	5 27	6 14
30	18 31	20 01	3 51	4 26	5 04	5 48
35	18 41	20 18	3 43	4 14	4 50	5 32
40	18 52	20 41	3 33	4 02	4 34	5 14
45	19 05	21 10	3 23	3 47	4 16	4 52
50	19 21	21 57	3 09	3 28	3 52	4 25
52	19 28	22 26	3 03	3 20	3 41	4 11
54	19 37	////	2 56	3 10	3 28	3 56
56	19 46	////	2 49	2 59	3 14	3 37
58	19 57	////	2 40	2 47	2 57	3 15
60	20 09	////	2 31	2 32	2 36	2 46
S						

GCT	Equation of Time (App.—Mean) 12	13	14
h	m s	m s	m s
0	+15 56.4	+15 49.4	+15 41.5
6	+15 54.8	+15 47.5	+15 39.4
12	+15 53.0	+15 45.5	+15 37.2
18	+15 51.2	+15 43.5	+15 35.0
24	+15 49.4	+15 41.5	+15 32.7

GCT of Transit Meridian of Greenwich

DAY	Moon	Venus	Mars	Jupiter	Saturn
	h m	h m	h m	h m	h m
12	23 06	8 48	8 14	20 55	9 20
13	23 55	8 48	8 13	20 51	9 16
14	24 46	8 48	8 11	20 47	9 13
15	0 46	8 48	8 09	20 43	9 09

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb	Venus	Mars
°	′	′	′
0			
	0.5	0.2	0.1
30			
	0.5	0.2	0.1
45			
	0.5	0.1	0.0
60			
	0.5	0.1	0.0
75			
	0.5	0.0	0.0
90			

Moon's Lower Limb
Add

Alt.	12	13	14
°	′	′	′
0			
	14.2	13.6	13.0
4			
	14.2	13.7	13.0
8			
	14.2	13.7	13.0
12			
	14.2	13.7	13.1
16			
	14.2	13.7	13.1
20			
	14.2	13.8	13.2
24			
	14.3	13.8	13.2
28			
	14.3	13.8	13.3
32			
	14.3	13.9	13.3
36			
	14.4	14.0	13.4
40			
	14.4	14.0	13.5
44			
	14.5	14.1	13.6
48			
	14.5	14.2	13.7
52			
	14.6	14.3	13.8
56			
	14.7	14.3	13.9
60			
	14.7	14.4	14.1
64			
	14.8	14.5	14.2
68			
	14.9	14.6	14.3
72			
	14.9	14.7	14.5
76			
	15.0	14.8	14.6
80			
	15.1	14.9	14.7
84			
	15.2	15.0	14.9
88			
	15.2	15.1	15.0
90			

Add to table, back cover

Moon's Upper Limb
Subtract

Alt.	12	13	14
°	′	′	′
0			
	16.4	16.6	17.0
4			
	16.3	16.6	17.0
8			
	16.3	16.6	17.0
12			
	16.3	16.6	16.9
16			
	16.3	16.6	16.9
20			
	16.3	16.5	16.9
24			
	16.2	16.5	16.8
28			
	16.2	16.4	16.7
32			
	16.2	16.4	16.7
36			
	16.1	16.3	16.6
40			
	16.1	16.3	16.5
44			
	16.0	16.2	16.4
48			
	16.0	16.1	16.3
52			
	15.9	16.0	16.2
56			
	15.8	15.9	16.1
60			
	15.8	15.8	15.9
64			
	15.7	15.8	15.8
68			
	15.6	15.7	15.7
72			
	15.6	15.6	15.6
76			
	15.5	15.5	15.4
80			
	15.4	15.4	15.3
84			
	15.3	15.2	15.1
88			
	15.3	15.2	15.0
90			

Subtract from table, back cover

Full Moon 13

GCT	♈	VENUS −4.0		MARS 1.7		JUPITER −2.3		SATURN 1.1		MOON			
	GHA	GHA	Dec.	GHA	Dec.	GHA	Dec.	GHA	Dec.	GHA	code	Dec.	code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
0	53 16.4	228 02.5	− 0 57.2	237 34.8	+ 3 33.2	48 24.3	+ 0 26.6	222 22.1	− 2 16.7	348 58.2	98	+26 25.8	+ 52
1	68 18.9	243 02.6	58.0	252 35.9	32.7	63 26.9	26.5	237 24.3	16.8	3 27.0	98	26 31.0	+ 51
2	83 21.4	258 02.7	58.8	267 37.1	32.1	78 29.4	26.5	252 26.5	16.9	17 55.8	98	26 36.1	+ 49
3	98 23.8	273 02.7	· 0 59.6	282 38.2	·· 31.5	93 32.0	·· 26.4	267 28.7	·· 17.0	32 24.6	97	·26 41.0	+ 48
4	113 26.3	288 02.8	1 00.5	297 39.3	31.0	108 34.6	26.4	282 31.0	17.1	46 53.3	98	26 45.8	+ 47
5	128 28.8	303 02.8	01.3	312 40.4	30.4	123 37.2	26.4	297 33.2	17.2	61 22.1	96	26 50.5	+ 45
6	143 31.2	318 02.9	− 1 02.1	327 41.5	+ 3 29.8	138 39.8	+ 0 26.3	312 35.4	− 2 17.2	75 50.7	97	+26 55.0	+ 44
7	158 33.7	333 02.9	02.9	342 42.6	29.3	153 42.4	26.3	327 37.6	17.3	90 19.4	96	26 59.4	+ 43
8	173 36.2	348 03.0	03.8	357 43.8	28.7	168 45.0	26.2	342 39.9	17.4	104 48.0	97	27 03.7	+ 41
9	188 38.6	3 03.0	·· 04.6	12 44.9	·· 28.1	183 47.5	·· 26.2	357 42.1	·· 17.5	119 16.7	96	·27 07.8	+ 40
10	203 41.1	18 03.1	05.4	27 46.0	27.6	198 50.1	26.2	12 44.3	17.6	133 45.3	96	27 11.8	+ 38
11	218 43.5	33 03.2	06.2	42 47.1	27.0	213 52.7	26.1	27 46.5	17.7	148 13.9	95	27 15.6	+ 37
12	233 46.0	48 03.2	− 1 07.0	57 48.2	+ 3 26.4	228 55.3	+ 0 26.1	42 48.8	− 2 17.8	162 42.4	96	+27 19.3	+ 36
13	248 48.5	63 03.3	07.9	72 49.4	25.9	243 57.9	26.0	57 51.0	17.9	177 11.0	95	27 22.9	+ 34
14	263 50.9	78 03.3	08.7	87 50.5	25.3	259 00.5	26.0	72 53.2	18.0	191 39.5	95	27 26.3	+ 33
15	278 53.4	93 03.4	·· 09.5	102 51.6	·· 24.7	274 03.0	·· 26.0	87 55.4	·· 18.1	206 08.0	95	·27 29.6	+ 31
16	293 55.9	108 03.4	10.4	117 52.7	24.2	289 05.6	25.9	102 57.7	18.2	220 36.5	95	27 32.7	+ 30
17	308 58.3	123 03.5	11.2	132 53.8	23.6	304 08.2	25.9	117 59.9	18.3	235 05.0	95	27 35.7	+ 29
18	324 00.8	138 03.5	− 1 12.0	147 54.9	+ 3 23.0	319 10.8	+ 0 25.8	133 02.1	− 2 18.4	249 33.5	94	+27 38.6	+ 27
19	339 03.3	153 03.6	12.8	162 56.1	22.5	334 13.4	25.8	148 04.3	18.5	264 01.9	95	27 41.3	+ 26
20	354 05.7	168 03.6	13.7	177 57.2	21.9	349 16.0	25.8	163 06.6	18.6	278 30.4	94	27 43.9	+ 24
21	9 08.2	183 03.7	·· 14.5	192 58.3	·· 21.3	4 18.5	·· 25.7	178 08.8	·· 18.7	292 58.8	95	·27 46.3	+ 23
22	24 10.7	198 03.7	15.3	207 59.4	20.8	19 21.1	25.7	193 11.0	18.7	307 27.3	94	27 48.6	+ 22
23	39 13.1	213 03.7	16.1	223 00.5	20.2	34 23.7	25.6	208 13.2	18.8	321 55.7	95	27 50.8	+ 20
0	54 15.6	228 03.8	− 1 17.0	238 01.7	+ 3 19.6	49 26.3	+ 0 25.6	223 15.5	− 2 18.9	336 24.2	94	+27 52.8	+ 19
1	69 18.0	243 03.8	17.8	253 02.8	19.1	64 28.9	25.6	238 17.7	19.0	350 52.6	94	27 54.7	+ 17
2	84 20.5	258 03.9	18.6	268 03.9	18.5	79 31.4	25.5	253 19.9	19.1	5 21.0	95	27 56.4	+ 16
3	99 23.0	273 03.9	·· 19.5	283 05.0	·· 17.9	94 34.0	·· 25.5	268 22.1	·· 19.2	19 49.5	94	·27 58.0	+ 15
4	114 25.4	288 04.0	20.3	298 06.1	17.4	109 36.6	25.5	283 24.4	19.3	34 17.9	94	27 59.5	+ 13
5	129 27.9	303 04.0	21.1	313 07.3	16.8	124 39.2	25.4	298 26.6	19.4	48 46.3	95	28 00.8	+ 12
6	144 30.4	318 04.1	− 1 22.0	328 08.4	+ 3 16.2	139 41.8	+ 0 25.4	313 28.8	− 2 19.5	63 14.8	94	+28 02.0	+ 10
7	159 32.8	333 04.1	22.8	343 09.5	15.7	154 44.3	25.3	328 31.0	19.6	77 43.2	95	28 03.0	+ 9
8	174 35.3	348 04.1	23.6	358 10.6	15.1	169 46.9	25.3	343 33.3	19.7	92 11.7	94	28 03.9	+ 7
9	189 37.8	3 04.2	·· 24.5	13 11.7	·· 14.5	184 49.5	·· 25.3	358 35.5	·· 19.8	106 40.1	95	·28 04.6	+ 6
10	204 40.2	18 04.2	25.3	28 12.9	14.0	199 52.1	25.2	13 37.7	19.9	121 08.6	95	28 05.2	+ 5
11	219 42.7	33 04.2	26.1	43 14.0	13.4	214 54.6	25.2	28 39.9	20.0	135 37.1	95	28 05.7	+ 4
12	234 45.2	48 04.3	− 1 27.0	58 15.1	+ 3 12.8	229 57.2	+ 0 25.2	43 42.2	− 2 20.1	150 05.6	95	+28 06.1	+ 1
13	249 47.6	63 04.3	27.8	73 16.2	12.3	244 59.8	25.1	58 44.4	20.1	164 34.1	95	28 06.2	+ 1
14	264 50.1	78 04.4	28.6	88 17.3	11.7	260 02.4	25.1	73 46.6	20.2	179 02.6	95	28 06.3	− 1
15	279 52.5	93 04.4	·· 29.5	103 18.5	·· 11.1	275 04.9	·· 25.1	88 48.9	·· 20.3	193 31.1	96	·28 06.2	− 2
16	294 55.0	108 04.4	30.3	118 19.6	10.6	290 07.5	25.0	103 51.1	20.4	207 59.7	96	28 06.0	− 4
17	309 57.5	123 04.5	31.2	133 20.7	10.0	305 10.1	25.0	118 53.3	20.5	222 28.3	96	28 05.6	− 5
18	324 59.9	138 04.5	− 1 32.0	148 21.8	+ 3 09.4	320 12.7	+ 0 25.0	133 55.5	− 2 20.6	236 56.9	96	+28 05.1	− 6
19	340 02.4	153 04.5	32.8	163 23.0	08.9	335 15.2	24.9	148 57.8	20.7	251 25.5	96	28 04.5	− 8
20	355 04.9	168 04.6	33.7	178 24.1	08.3	350 17.8	24.9	164 00.0	20.8	265 54.1	97	28 03.7	− 9
21	10 07.3	183 04.6	·· 34.5	193 25.2	·· 07.7	5 20.4	·· 24.8	179 02.2	·· 20.9	280 22.8	96	·28 02.8	− 11
22	25 09.8	198 04.6	35.4	208 26.3	07.2	20 23.0	24.8	194 04.4	21.0	294 51.4	97	28 01.7	− 12
23	40 12.3	213 04.7	36.2	223 27.4	06.6	35 25.5	24.8	209 06.7	21.1	309 20.1	98	28 00.5	− 13
0	55 14.7	228 04.7	− 1 37.0	238 28.6	+ 3 06.1	50 28.1	+ 0 24.7	224 08.9	− 2 21.2	323 48.9	97	+27 59.2	− 15
1	70 17.2	243 04.7	37.9	253 29.7	05.5	65 30.7	24.7	239 11.1	21.3	338 17.6	98	27 57.7	− 16
2	85 19.7	258 04.8	38.7	268 30.8	04.9	80 33.3	24.7	254 13.4	21.3	352 46.4	98	27 56.1	− 17
3	100 22.1	273 04.8	·· 39.6	283 31.9	·· 04.4	95 35.8	·· 24.6	269 15.6	·· 21.4	7 15.2	99	·27 54.4	− 19
4	115 24.6	288 04.8	40.4	298 33.1	03.8	110 38.4	24.6	284 17.8	21.5	21 44.1	99	27 52.5	− 20
5	130 27.0	303 04.8	41.2	313 34.2	03.2	125 41.0	24.6	299 20.0	21.6	36 13.0	99	27 50.5	− 22
6	145 29.5	318 04.9	− 1 42.1	328 35.3	+ 3 02.7	140 43.5	+ 0 24.5	314 22.3	− 2 21.7	50 41.9	100	+27 48.3	− 22
7	160 32.0	333 04.9	42.9	343 36.4	02.1	155 46.1	24.5	329 24.5	21.8	65 10.9	99	27 46.1	− 24
8	175 34.4	348 04.9	43.8	358 37.5	01.5	170 48.7	24.5	344 26.7	21.9	79 39.8	101	27 43.7	− 26
9	190 36.9	3 05.0	·· 44.6	13 38.7	·· 01.0	185 51.2	·· 24.4	359 28.9	·· 22.0	94 08.9	100	·27 41.1	− 27
10	205 39.4	18 05.0	45.5	28 39.8	3 00.4	200 53.8	24.4	14 31.2	22.1	108 37.9	101	27 38.4	− 28
11	220 41.8	33 05.0	46.3	43 40.9	2 59.8	215 56.4	24.4	29 33.4	22.2	123 07.0	102	27 35.6	− 29
12	235 44.3	48 05.0	− 1 47.2	58 42.0	+ 2 59.3	230 59.0	+ 0 24.3	44 35.6	− 2 22.3	137 36.2	102	+27 32.7	− 31
13	250 46.8	63 05.1	48.0	73 43.2	58.7	246 01.5	24.3	59 37.9	22.4	152 05.4	102	27 29.6	− 32
14	265 49.2	78 05.1	48.9	88 44.3	58.1	261 04.1	24.3	74 40.1	22.5	166 34.6	102	27 26.4	− 34
15	280 51.7	93 05.1	·· 49.7	103 45.4	·· 57.6	276 06.7	·· 24.2	89 42.3	·· 22.5	181 03.8	104	·27 23.0	− 34
16	295 54.1	108 05.1	50.6	118 46.5	57.0	291 09.2	24.2	104 44.6	22.6	195 33.2	103	27 19.6	− 36
17	310 56.6	123 05.1	51.4	133 47.7	56.4	306 11.8	24.2	119 46.8	22.7	210 02.5	104	27 16.0	− 38
18	325 59.1	138 05.2	− 1 52.2	148 48.8	+ 2 55.9	321 14.4	+ 0 24.1	134 49.0	− 2 22.8	224 31.9	104	+27 12.2	− 38
19	341 01.5	153 05.2	53.1	163 49.9	55.3	336 16.9	24.1	149 51.2	22.9	239 01.3	105	27 08.4	− 40
20	356 04.0	168 05.2	53.9	178 51.0	54.7	351 19.5	24.1	164 53.5	23.0	253 30.8	106	27 04.4	− 41
21	11 06.5	183 05.2	·· 54.8	193 52.2	·· 54.2	6 22.1	·· 24.0	179 55.7	·· 23.1	268 00.4	106	·27 00.3	− 43
22	26 08.9	198 05.2	55.6	208 53.3	53.6	21 24.6	24.0	194 57.9	23.2	282 30.0	106	26 56.0	− 43
23	41 11.4	213 05.3	56.5	223 54.4	53.1	36 27.2	24.0	210 00.2	23.3	296 59.6	107	26 51.7	− 45
24	56 13.9	228 05.3	− 1 57.3	238 55.5	+ 2 52.5	51 29.8	+ 0 23.9	225 02.4	− 2 23.4	311 29.3	107	+26 47.2	− 46
code	—	0	− 8	+ 11	− 5	+ 26	− 1	+ 22	0				

GCT h	SUN GHA ° ′	Dec. ° ′
0	183 53.1	−18 13.5
1	198 53.0	14.1
2	213 52.9	14.8
3	228 52.8	•• 15.4
4	243 52.7	16.1
5	258 52.7	16.7
6	273 52.6	−18 17.4
7	288 52.5	18.0
8	303 52.4	18.7
9	318 52.3	•• 19.3
10	333 52.2	19.9
11	348 52.1	20.6
12	3 52.0	−18 21.2
13	18 51.9	21.9
14	33 51.8	22.5
15	48 51.7	•• 23.2
16	63 51.6	23.8
17	78 51.5	24.5
18	93 51.4	−18 25.1
19	108 51.2	25.7
20	123 51.1	26.4
21	138 51.0	•• 27.0
22	153 50.9	27.7
23	168 50.8	28.3
0	183 50.7	−18 28.9
1	198 50.6	29.6
2	213 50.5	30.2
3	228 50.4	•• 30.9
4	243 50.3	31.5
5	258 50.2	32.1
6	273 50.1	−18 32.8
7	288 50.0	33.4
8	303 49.9	34.0
9	318 49.8	•• 34.7
10	333 49.7	35.3
11	348 49.6	35.9
12	3 49.4	−18 36.6
13	18 49.3	37.2
14	33 49.2	37.8
15	48 49.1	•• 38.5
16	63 49.0	39.1
17	78 48.9	39.7
18	93 48.8	−18 40.3
19	108 48.7	41.0
20	123 48.6	41.6
21	138 48.4	•• 42.2
22	153 48.3	42.9
23	168 48.2	43.5
0	183 48.1	−18 44.1
1	198 48.0	44.7
2	213 47.9	45.4
3	228 47.8	•• 46.0
4	243 47.7	46.6
5	258 47.5	47.2
6	273 47.4	−18 47.8
7	288 47.3	48.5
8	303 47.2	49.1
9	318 47.1	•• 49.7
10	333 47.0	50.3
11	348 46.8	50.9
12	3 46.7	−18 51.6
13	18 46.6	52.2
14	33 46.5	52.8
15	48 46.4	•• 53.4
16	63 46.2	54.0
17	78 46.1	54.6
18	93 46.0	−18 55.3
19	108 45.9	55.9
20	123 45.8	56.5
21	138 45.6	•• 57.1
22	153 45.5	57.7
23	168 45.4	58.3
24	183 45.3	−18 58.9
code	—	− 6

STARS No.	SHA ° ′	Dec. ° ′	Transit Mer. Gr. h m
1	358 31.3	+28 49.7	20 26
2	358 20.8	+58 53.4	20 26
3	349 42.0	−18 15.0	21 01
4	339 19.8	+59 59.4	21 42
5	336 00.3	−57 28.8	21 55
6	332 17.9	+89 02.5	22 10
7	328 52.8	+23 14.4	22 24
8	315 52.9	−40 29.7	23 16
9	309 46.4	+49 41.7	23 40
10	291 42.2	+16 25.0	0 56
11	281 56.3	− 8 15.1	1 35
12	281 42.5	+45 57.2	1 36
13	279 21.4	+ 6 18.7	1 45
14	279 10.9	+28 34.3	1 46
15	276 33.1	− 1 13.6	1 56
16	271 51.2	+ 7 24.2	2 15
17	264 16.3	−52 39.8	2 45
18	259 14.3	−16 38.6	3 06
19	255 48.7	−28 54.0	3 19
20	245 48.0	+ 5 21.1	3 59
21	244 24.1	+28 08.7	4 05
22	234 37.0	−59 20.8	4 44
23	223 26.6	−43 13.9	5 28
24	221 49.9	−69 30.7	5 35
25	218 41.6	− 8 26.8	5 47
26	208 32.8	+12 12.2	6 28
27	194 48.3	+62 00.4	7 23
28	183 21.0	+14 50.4	8 08
29	174 02.0	−62 49.8	8 45
30	172 53.3	−56 50.4	8 50
31	168 47.2	−59 25.4	9 06
32	167 01.4	+56 13.0	9 13
33	159 30.4	+55 10.4	9 43
34	159 20.4	−10 54.6	9 44
35	153 35.6	+49 33.0	10 07
36	149 02.7	−36 08.0	10 25
37	146 38.2	+19 25.9	10 35
38	140 56.0	−60 38.3	10 57
39	137 18.5	+74 21.0	11 12
40	126 50.5	+26 52.5	11 54
41	120 38.0	−22 29.2	12 18
42	113 23.5	−26 19.7	12 47
43	109 07.6	−68 56.7	13 04
44	103 06.0	−15 40.1	13 28
45	97 25.2	−37 04.4	13 51
46	96 49.7	+12 35.6	13 53
47	91 08.1	+51 29.7	14 16
48	84 45.5	−34 24.7	14 42
49	81 10.7	+38 44.3	14 56
50	76 55.9	−26 21.7	15 13
51	62 53.6	+ 8 44.4	16 09
52	54 32.2	−56 53.8	16 42
53	50 03.3	+45 06.7	17 00
54	34 32.6	+ 9 39.3	18 02
55	28 41.6	−47 11.9	18 25
56	16 14.8	−29 52.8	19 15
57	14 24.4	+14 56.9	19 22

Lat. °	Sunrise h m	Twlt. begins h m	Moonrise 15 h m	16 h m	17 h m	18 h m
N 70	9 51	5 35	□	□	□	□
68	9 14	5 34	□	□	□	□
66	8 48	5 32	□	□	□	□
64	8 28	5 30	□	□	□	16 51
62	8 12	5 28	14 07	□	15 56	17 44
60	7 59	5 27	15 00	15 39	16 48	18 15
58	7 47	5 25	15 32	16 16	17 20	18 39
56	7 37	5 24	15 56	16 41	17 44	18 58
54	7 28	5 22	16 16	17 02	18 03	19 14
52	7 20	5 21	16 32	17 19	18 19	19 28
50	7 13	5 19	16 46	17 34	18 33	19 39
45	6 58	5 15	17 15	18 04	19 01	20 04
40	6 45	5 10	17 37	18 27	19 24	20 24
35	6 35	5 07	17 56	18 47	19 42	20 40
30	6 25	5 01	18 12	19 03	19 58	20 54
20	6 09	4 52	18 40	19 31	20 24	21 18
10	5 55	4 41	19 03	19 55	20 47	21 39
0	5 41	4 28	19 25	20 17	21 09	21 58
10	5 27	4 13	19 47	20 40	21 30	22 17
20	5 13	3 53	20 11	21 04	21 53	22 38
30	4 56	3 26	20 39	21 32	22 19	23 01
35	4 46	3 08	20 55	21 48	22 35	23 15
40	4 34	2 45	21 14	22 08	22 53	23 31
45	4 21	2 15	21 37	22 31	23 15	23 50
50	4 04	1 26	22 07	23 01	23 42	24 13
52	3 56	0 52	22 22	23 16	23 56	24 25
54	3 48	////	22 39	23 33	24 11	0 11
56	3 38	////	23 00	23 54	24 30	0 30
58	3 27	////	23 26	24 20	0 20	0 52
60	3 14	////	24 02	0 02	0 56	1 20
S						

Lat. °	Sunset h m	Twlt. ends h m	Moonset 15 h m	16 h m	17 h m	18 h m
N 70	13 37	17 50	□	□	□	□
68	14 14	17 52	□	□	□	□
66	14 40	17 54	□	□	□	□
64	15 00	17 56	□	□	□	14 49
62	15 16	17 58	12 12	□	14 00	13 56
60	15 30	18 00	11 19	12 29	13 07	13 23
58	15 42	18 02	10 47	11 53	12 35	12 59
56	15 52	18 04	10 23	11 27	12 11	12 40
54	16 00	18 05	10 04	11 06	11 52	12 24
52	16 08	18 06	9 48	10 49	11 35	12 10
50	16 16	18 09	9 34	10 34	11 21	11 57
45	16 31	18 13	9 06	10 04	10 53	11 32
40	16 44	18 18	8 43	9 41	10 30	11 12
35	16 54	18 21	8 25	9 21	10 11	10 55
30	17 04	18 27	8 09	9 05	9 55	10 40
20	17 20	18 36	7 43	8 37	9 28	10 15
10	17 35	18 48	7 20	8 13	9 04	9 53
0	17 48	19 01	6 58	7 50	8 42	9 33
10	18 02	19 17	6 37	7 28	8 20	9 12
20	18 17	19 37	6 14	7 04	7 57	8 50
30	18 34	20 04	5 48	6 36	7 29	8 25
35	18 44	20 23	5 32	6 20	7 13	8 10
40	18 56	20 46	5 14	6 00	6 54	7 52
45	19 09	21 17	4 52	5 37	6 30	7 31
50	19 26	22 08	4 25	5 07	6 01	7 04
52	19 34	22 44	4 11	4 52	5 46	6 51
54	19 43	////	3 56	4 35	5 29	6 35
56	19 53	////	3 37	4 14	5 08	6 17
58	20 04	////	3 15	3 48	4 42	5 56
60	20 17	////	2 46	3 11	4 06	5 27
S						

ADDITIONAL ALTITUDE CORRECTIONS

Alt. °	Sun's Low'r Limb ′	Venus ′	Mars ′
0			
	0.5	0.2	0.1
30			
	0.5	0.2	0.1
45			
	0.5	0.1	0.0
60			
	0.5	0.1	0.0
75			
	0.5	0.0	0.0
90			

Moon's Lower Limb
Add

Alt. °	15 ′	16 ′	17 ′
0			
	12.6	12.2	12.0
4			
	12.6	12.3	12.0
8			
	12.7	12.3	12.0
12			
	12.7	12.3	12.1
16			
	12.7	12.4	12.1
20			
	12.8	12.4	12.2
24			
	12.9	12.5	12.3
28			
	12.9	12.6	12.4
32			
	13.0	12.7	12.5
36			
	13.1	12.8	12.6
40			
	13.2	12.9	12.7
44			
	13.3	13.0	12.8
48			
	13.4	13.2	13.0
52			
	13.6	13.3	13.1
56			
	13.7	13.5	13.3
60			
	13.8	13.6	13.5
64			
	14.0	13.8	13.6
68			
	14.1	14.0	13.8
72			
	14.3	14.1	14.0
76			
	14.4	14.3	14.2
80			
	14.6	14.5	14.4
84			
	14.8	14.7	14.6
88			
	14.9	14.8	14.7
90			

Add to table, back cover

Moon's Upper Limb
Subtract

Alt. °	15 ′	16 ′	17 ′
0			
	17.2	17.4	17.6
4			
	17.2	17.4	17.6
8			
	17.2	17.4	17.5
12			
	17.2	17.4	17.5
16			
	17.1	17.3	17.5
20			
	17.1	17.3	17.4
24			
	17.0	17.2	17.3
28			
	16.9	17.1	17.2
32			
	16.8	17.0	17.1
36			
	16.7	16.9	17.0
40			
	16.6	16.8	16.9
44			
	16.5	16.6	16.7
48			
	16.4	16.5	16.6
52			
	16.3	16.4	16.4
56			
	16.1	16.2	16.3
60			
	16.0	16.1	16.1
64			
	15.9	15.9	15.9
68			
	15.7	15.7	15.7
72			
	15.6	15.6	15.6
76			
	15.4	15.4	15.4
80			
	15.2	15.2	15.2
84			
	15.1	15.0	15.0
88			
	15.0	14.9	14.8
90			

Subtract from table, back cover

Equation of Time (App.—Mean)

GCT h	15 m s	16 m s	17 m s
0	+15 32.7	+15 23.1	+15 12.7
6	+15 30.4	+15 20.6	+15 09.9
12	+15 28.0	+15 18.0	+15 07.1
18	+15 25.6	+15 15.4	+15 04.3
24	+15 23.1	+15 12.7	+15 01.4

GCT of Transit Meridian of Greenwich

DAY	Moon h m	Venus h m	Mars h m	Jupiter h m	Saturn h m
15	0 46	8 48	8 09	20 43	9 09
16	1 38	8 48	8 07	20 39	9 06
17	2 30	8 48	8 06	20 35	9 02
18	3 21	8 48	8 04	20 31	8 59

G C T	♈ GHA	VENUS −4.0 GHA	VENUS Dec.	MARS 1.7 GHA	MARS Dec.	JUPITER −2.3 GHA	JUPITER Dec.	SATURN 1.1 GHA	SATURN Dec.	MOON GHA	code	MOON Dec.	code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
0	56 13.9	228 05.3	− 1 57.3	238 55.5	+ 2 52.5	51 29.8	+ 0 23.9	225 02.4	− 2 23.4	311 29.3	107	+26 47.2	− 46
1	71 16.3	243 05.3	58.2	253 56.7	51.9	66 32.3	23.9	240 04.6	23.5	325 59.0	108	26 42.6	− 48
2	86 18.8	258 05.3	59.1	268 57.8	51.4	81 34.9	23.9	255 06.8	23.6	340 28.8	109	26 37.8	− 48
3	101 21.3	273 05.3	· 1 59.9	283 58.9	·· 50.8	96 37.4	·· 23.9	270 09.1	·· 23.6	354 58.7	108	·26 33.0	− 50
4	116 23.7	288 05.3	2 00.8	299 00.0	50.2	111 40.0	23.8	285 11.3	23.7	9 28.5	110	26 28.0	− 51
5	131 26.2	303 05.4	01.6	314 01.2	49.7	126 42.6	23.8	300 13.5	23.8	23 58.5	110	26 22.9	− 53
6	146 28.6	318 05.4	− 2 02.5	329 02.3	+ 2 49.1	141 45.1	+ 0 23.8	315 15.8	− 2 23.9	38 28.5	110	+26 17.6	− 53
7	161 31.1	333 05.4	03.3	344 03.4	48.5	156 47.7	23.7	330 18.0	24.0	52 58.5	112	26 12.3	− 55
8	176 33.6	348 05.4	04.2	359 04.5	48.0	171 50.3	23.7	345 20.2	24.1	67 28.7	111	26 06.8	− 56
9	191 36.0	3 05.4	·· 05.0	14 05.7	·· 47.4	186 52.8	·· 23.7	0 22.5	·· 24.2	81 58.8	112	·26 01.2	− 57
10	206 38.5	18 05.4	05.9	29 06.8	46.8	201 55.4	23.6	15 24.7	24.3	96 29.0	113	25 55.5	− 58
11	221 41.0	33 05.4	06.7	44 07.9	46.3	216 57.9	23.6	30 26.9	24.4	110 59.3	114	25 49.7	− 60
12	236 43.4	48 05.4	− 2 07.6	59 09.0	+ 2 45.7	232 00.5	+ 0 23.6	45 29.2	− 2 24.5	125 29.7	113	+25 43.7	− 60
13	251 45.9	63 05.4	08.5	74 10.2	45.2	247 03.1	23.6	60 31.4	24.6	140 00.0	115	25 37.7	− 62
14	266 48.4	78 05.5	09.3	89 11.3	44.6	262 05.6	23.5	75 33.6	24.6	154 30.5	115	25 31.5	− 63
15	281 50.8	93 05.5	·· 10.2	104 12.4	·· 44.0	277 08.2	·· 23.5	90 35.8	·· 24.7	169 01.0	116	·25 25.2	− 64
16	296 53.3	108 05.5	11.0	119 13.5	43.5	292 10.8	23.5	105 38.1	24.8	183 31.6	116	25 18.8	− 66
17	311 55.8	123 05.5	11.9	134 14.7	42.9	307 13.3	23.4	120 40.3	24.9	198 02.2	117	25 12.2	− 66
18	326 58.2	138 05.5	− 2 12.7	149 15.8	+ 2 42.3	322 15.9	+ 0 23.4	135 42.5	− 2 25.0	212 32.9	117	+25 05.6	− 68
19	342 00.7	153 05.5	13.6	164 16.9	41.8	337 18.4	23.4	150 44.8	25.1	227 03.6	118	24 58.8	− 68
20	357 03.1	168 05.5	14.5	179 18.1	41.2	352 21.0	23.4	165 47.0	25.2	241 34.4	119	24 52.0	− 70
21	12 05.6	183 05.5	·· 15.3	194 19.2	·· 40.6	7 23.5	·· 23.3	180 49.2	·· 25.3	256 05.3	119	·24 45.0	− 71
22	27 08.1	198 05.5	16.2	209 20.3	40.1	22 26.1	23.3	195 51.5	25.4	270 36.2	120	24 37.9	− 72
23	42 10.5	213 05.5	17.0	224 21.4	39.5	37 28.7	23.3	210 53.7	25.5	285 07.2	120	24 30.7	− 73
0	57 13.0	228 05.5	− 2 17.9	239 22.6	+ 2 38.9	52 31.2	+ 0 23.2	225 55.9	− 2 25.6	299 38.2	121	+24 23.4	− 74
1	72 15.5	243 05.5	18.8	254 23.7	38.4	67 33.8	23.2	240 58.2	25.6	314 09.3	122	24 16.0	− 75
2	87 17.9	258 05.5	19.6	269 24.8	37.8	82 36.3	23.2	256 00.4	25.7	328 40.5	122	24 08.5	− 76
3	102 20.4	273 05.5	·· 20.5	284 26.0	·· 37.3	97 38.9	·· 23.2	271 02.6	·· 25.8	343 11.7	123	·24 00.9	− 78
4	117 22.9	288 05.5	21.4	299 27.1	36.7	112 41.4	23.1	286 04.9	25.9	357 43.0	123	23 53.1	− 78
5	132 25.3	303 05.5	22.2	314 28.2	36.1	127 44.0	23.1	301 07.1	26.0	12 14.3	124	23 45.3	− 79
6	147 27.8	318 05.5	− 2 23.1	329 29.3	+ 2 35.6	142 46.6	+ 0 23.1	316 09.3	− 2 26.1	26 45.7	125	+23 37.4	− 81
7	162 30.3	333 05.5	23.9	344 30.5	35.0	157 49.1	23.0	331 11.6	26.2	41 17.2	125	23 29.3	− 81
8	177 32.7	348 05.5	24.8	359 31.6	34.4	172 51.7	23.0	346 13.8	26.3	55 48.7	126	23 21.2	− 83
9	192 35.2	3 05.5	·· 25.7	14 32.7	·· 33.9	187 54.2	·· 23.0	1 16.0	·· 26.4	70 20.3	126	·23 12.9	− 83
10	207 37.6	18 05.5	26.5	29 33.8	33.3	202 56.8	23.0	16 18.2	26.5	84 51.9	127	23 04.6	− 85
11	222 40.1	33 05.5	27.4	44 35.0	32.7	217 59.3	22.9	31 20.5	26.5	99 23.6	128	22 56.1	− 85
12	237 42.6	48 05.5	− 2 28.3	59 36.1	+ 2 32.2	233 01.9	+ 0 22.9	46 22.7	− 2 26.6	113 55.4	128	+22 47.6	− 87
13	252 45.0	63 05.5	29.1	74 37.2	31.6	248 04.4	22.9	61 24.9	26.7	128 27.2	129	22 38.9	− 88
14	267 47.5	78 05.5	30.0	89 38.4	31.1	263 07.0	22.9	76 27.2	26.8	142 59.1	129	22 30.1	− 88
15	282 50.0	93 05.5	·· 30.9	104 39.5	·· 30.5	278 09.5	·· 22.8	91 29.4	·· 26.9	157 31.0	130	·22 21.3	− 89
16	297 52.4	108 05.5	31.7	119 40.6	29.9	293 12.1	22.8	106 31.6	27.0	172 03.0	131	22 12.4	− 91
17	312 54.9	123 05.5	32.6	134 41.8	29.4	308 14.6	22.8	121 33.9	27.1	186 35.1	131	22 03.3	− 91
18	327 57.4	138 05.5	− 2 33.5	149 42.9	+ 2 28.8	323 17.2	+ 0 22.8	136 36.1	− 2 27.2	201 07.2	131	+21 54.2	− 93
19	342 59.8	153 05.5	34.3	164 44.0	28.2	338 19.8	22.7	151 38.3	27.3	215 39.3	133	21 44.9	− 93
20	358 02.3	168 05.5	35.2	179 45.1	27.7	353 22.3	22.7	166 40.6	27.4	230 11.6	133	21 35.6	− 94
21	13 04.8	183 05.5	·· 36.1	194 46.3	·· 27.1	8 24.9	·· 22.7	181 42.8	·· 27.4	244 43.9	133	·21 26.2	− 95
22	28 07.2	198 05.5	36.9	209 47.4	26.5	23 27.4	22.7	196 45.0	27.5	259 16.2	134	21 16.7	− 96
23	43 09.7	213 05.4	37.8	224 48.5	26.0	38 30.0	22.6	211 47.3	27.6	273 48.6	135	21 07.1	− 97
0	58 12.1	228 05.4	− 2 38.7	239 49.7	+ 2 25.4	53 32.5	+ 0 22.6	226 49.5	− 2 27.7	288 21.1	135	+20 57.4	− 98
1	73 14.6	243 05.4	39.6	254 50.8	24.9	68 35.1	22.6	241 51.8	27.8	302 53.6	136	20 47.6	− 99
2	88 17.1	258 05.4	40.4	269 51.9	24.3	83 37.6	22.6	256 54.0	27.9	317 26.2	136	20 37.7	−100
3	103 19.5	273 05.4	·· 41.3	284 53.1	·· 23.7	98 40.1	·· 22.5	271 56.2	·· 28.0	331 58.8	137	·20 27.7	−100
4	118 22.0	288 05.4	42.2	299 54.2	23.2	113 42.7	22.5	286 58.5	28.1	346 31.5	137	20 17.7	−101
5	133 24.5	303 05.4	43.0	314 55.3	22.6	128 45.2	22.5	302 00.7	28.2	1 04.2	138	20 07.6	−103
6	148 26.9	318 05.4	− 2 43.9	329 56.4	+ 2 22.0	143 47.8	+ 0 22.5	317 02.9	− 2 28.2	15 37.0	138	+19 57.3	−103
7	163 29.4	333 05.4	44.8	344 57.6	21.5	158 50.3	22.4	332 05.2	28.3	30 09.8	139	19 47.0	−104
8	178 31.9	348 05.3	45.7	359 58.7	20.9	173 52.9	22.4	347 07.4	28.4	44 42.7	140	19 36.6	−105
9	193 34.3	3 05.3	·· 46.5	14 59.8	·· 20.4	188 55.4	·· 22.4	2 09.6	·· 28.5	59 15.7	140	·19 26.1	−105
10	208 36.8	18 05.3	47.4	30 01.0	19.8	203 58.0	22.4	17 11.9	28.6	73 48.7	140	19 15.6	−107
11	223 39.2	33 05.3	48.3	45 02.1	19.2	219 00.5	22.4	32 14.1	28.7	88 21.7	142	19 04.9	−107
12	238 41.7	48 05.3	− 2 49.2	60 03.2	+ 2 18.7	234 03.1	+ 0 22.3	47 16.3	− 2 28.8	102 54.9	141	+18 54.2	−108
13	253 44.2	63 05.3	50.0	75 04.4	18.1	249 05.6	22.3	62 18.6	28.9	117 28.0	142	18 43.4	−109
14	268 46.6	78 05.2	50.9	90 05.5	17.5	264 08.2	22.3	77 20.8	29.0	132 01.2	143	18 32.5	−110
15	283 49.1	93 05.2	·· 51.8	105 06.6	·· 17.0	279 10.7	·· 22.3	92 23.0	·· 29.0	146 34.5	143	·18 21.5	−111
16	298 51.6	108 05.2	52.7	120 07.8	16.4	294 13.3	22.2	107 25.3	29.1	161 07.8	143	18 10.4	−111
17	313 54.0	123 05.2	53.5	135 08.9	15.8	309 15.8	22.2	122 27.5	29.2	175 41.1	144	17 59.3	−112
18	328 56.5	138 05.2	− 2 54.4	150 10.0	+ 2 15.3	324 18.3	+ 0 22.2	137 29.7	− 2 29.3	190 14.5	144	+17 48.1	−113
19	343 59.0	153 05.1	55.3	165 11.2	14.7	339 20.9	22.2	152 32.0	29.4	204 47.9	145	17 36.8	−114
20	359 01.4	168 05.1	56.2	180 12.3	14.2	354 23.4	22.2	167 34.2	29.5	219 21.4	146	17 25.4	−114
21	14 03.9	183 05.1	·· 57.0	195 13.4	·· 13.6	9 26.0	·· 22.1	182 36.5	·· 29.6	233 55.0	145	·17 14.0	−115
22	29 06.4	198 05.1	57.9	210 14.6	13.0	24 28.5	22.1	197 38.7	29.7	248 28.5	147	17 02.5	−116
23	44 08.8	213 05.1	58.8	225 15.7	12.5	39 31.1	22.1	212 40.9	29.8	263 02.2	146	16 50.9	−117
24	59 11.3	228 05.0	− 2 59.7	240 16.8	+ 2 11.9	54 33.6	+ 0 22.1	227 43.2	− 2 29.8	277 35.8	147	+16 39.2	−117
code	—	0	− 8	+ 11	− 6	+ 25	0	+ 22	− 1				

GCT	SUN GHA	SUN Dec.
h	° ′	° ′
0	183 45.3	−18 58.9
1	198 45.2	18 59.5
2	213 45.0	19 00.2
3	228 44.9	•• 00.8
4	243 44.8	01.4
5	258 44.7	02.0
6	273 44.5	−19 02.6
7	288 44.4	03.2
8	303 44.3	03.8
9	318 44.2	•• 04.4
10	333 44.0	05.0
11	348 43.9	05.6
12	3 43.8	−19 06.2
13	18 43.7	06.8
14	33 43.5	07.4
15	48 43.4	•• 08.0
16	63 43.3	08.6
17	78 43.1	09.2
18	93 43.0	−19 09.8
19	108 42.9	10.4
20	123 42.8	11.0
21	138 42.6	•• 11.6
22	153 42.5	12.2
23	168 42.4	12.8
0	183 42.2	−19 13.4
1	198 42.1	14.0
2	213 42.0	14.6
3	228 41.8	•• 15.2
4	243 41.7	15.8
5	258 41.6	16.4
6	273 41.4	−19 17.0
7	288 41.3	17.6
8	303 41.2	18.2
9	318 41.0	•• 18.8
10	333 40.9	19.4
11	348 40.8	20.0
12	3 40.6	−19 20.5
13	18 40.5	21.1
14	33 40.4	21.7
15	48 40.2	•• 22.3
16	63 40.1	22.9
17	78 40.0	23.5
18	93 39.8	−19 24.1
19	108 39.7	24.7
20	123 39.5	25.2
21	138 39.4	•• 25.8
22	153 39.3	26.4
23	168 39.1	27.0
0	183 39.0	−19 27.6
1	198 38.8	28.2
2	213 38.7	28.7
3	228 38.6	•• 29.3
4	243 38.4	29.9
5	258 38.3	30.5
6	273 38.1	−19 31.1
7	288 38.0	31.6
8	303 37.9	32.2
9	318 37.7	•• 32.8
10	333 37.6	33.4
11	348 37.4	33.9
12	3 37.3	−19 34.5
13	18 37.1	35.1
14	33 37.0	35.7
15	48 36.8	•• 36.2
16	63 36.7	36.8
17	78 36.6	37.4
18	93 36.4	−19 38.0
19	108 36.3	38.5
20	123 36.1	39.1
21	138 36.0	•• 39.7
22	153 35.8	40.2
23	168 35.7	40.8
24	183 35.5	−19 41.4
code	—	− 6

STARS No.	SHA	Dec.	Transit Mer. Gr.
	° ′	° ′	h m
1	358 31.4	+28 49.7	20 14
2	358 20.8	+58 53.4	20 14
3	349 42.0	−18 15.0	20 49
4	339 19.9	+59 59.5	21 30
5	336 00.4	−57 28.9	21 44
6	332 18.2	+89 02.6	21 58
7	328 52.8	+23 14.4	22 12
8	315 52.9	−40 29.7	23 04
9	309 46.3	+49 41.7	23 28
10	291 42.2	+16 25.0	0 44
11	281 56.2	− 8 15.1	1 23
12	281 42.5	+45 57.2	1 24
13	279 21.4	+ 6 18.7	1 33
14	279 10.8	+28 34.3	1 34
15	276 33.1	− 1 13.6	1 45
16	271 51.1	+ 7 24.2	2 03
17	264 16.3	−52 39.8	2 34
18	259 14.3	−16 38.6	2 54
19	255 48.7	−28 54.0	3 07
20	245 48.0	+ 5 21.1	3 47
21	244 24.1	+28 08.7	3 53
22	234 36.9	−59 20.8	4 32
23	223 26.6	−43 13.9	5 16
24	221 49.9	−69 30.7	5 23
25	218 41.6	− 8 26.8	5 35
26	208 32.7	+12 12.2	6 16
27	194 48.2	+62 00.4	7 11
28	183 21.0	+14 50.4	7 56
29	174 02.0	−62 49.7	8 34
30	172 53.2	−56 50.4	8 38
31	168 47.2	−59 25.4	8 55
32	167 01.4	+56 13.0	9 02
33	159 30.4	+55 10.4	9 32
34	159 20.4	−10 54.6	9 32
35	153 35.5	+49 33.0	9 55
36	149 02.7	−36 08.0	10 13
37	146 38.2	+19 25.8	10 23
38	140 56.0	−60 38.3	10 46
39	137 18.5	+74 20.9	11 00
40	126 50.5	+26 52.5	11 42
41	120 38.0	−22 29.2	12 07
42	113 23.5	−26 19.7	12 35
43	109 07.6	−68 56.7	12 53
44	103 06.0	−15 40.1	13 17
45	97 25.2	−37 04.4	13 39
46	96 49.7	+12 35.6	13 42
47	91 08.1	+51 29.7	14 04
48	84 45.5	−34 24.7	14 30
49	81 10.7	+38 44.3	14 44
50	76 55.9	−26 21.7	15 01
51	62 53.6	+ 8 44.4	15 57
52	54 32.2	−56 53.8	16 30
53	50 03.3	+45 06.7	16 48
54	34 32.6	+ 9 39.3	17 50
55	28 41.6	−47 11.9	18 13
56	16 14.8	−29 52.8	19 03
57	14 24.4	+14 56.9	19 10

Lat.	Sunrise	Twlt. begins	Moonrise 18	19	20	21
N °	h m	h m	h m	h m	h m	h m
70	10 13	5 44	□	□	19 23	21 44
68	9 29	5 41	□	□	20 00	22 01
66	9 00	5 39	□	18 21	20 27	22 15
64	8 38	5 37	16 51	19 00	20 47	22 26
62	8 21	5 35	17 44	19 26	21 03	22 36
60	8 06	5 33	18 15	19 47	21 16	22 44
58	7 54	5 31	18 39	20 03	21 28	22 51
56	7 43	5 28	18 58	20 17	21 38	22 57
54	7 34	5 27	19 14	20 30	21 46	23 03
52	7 26	5 25	19 28	20 40	21 54	23 08
50	7 18	5 22	19 39	20 50	22 01	23 13
45	7 02	5 19	20 04	21 10	22 16	23 23
40	6 49	5 14	20 24	21 26	22 28	23 31
35	6 38	5 09	20 40	21 39	22 39	23 38
30	6 28	5 04	20 54	21 51	22 48	23 44
20	6 11	4 54	21 18	22 11	23 03	23 54
10	5 56	4 42	21 39	22 29	23 17	24 03
0	5 42	4 29	21 58	22 45	23 29	24 12
10	5 27	4 12	22 17	23 01	23 42	24 20
20	5 12	3 51	22 38	23 18	23 55	24 29
30	4 54	3 24	23 01	23 38	24 10	0 10
35	4 44	3 06	23 15	23 49	24 19	0 19
40	4 32	2 42	23 31	24 02	0 02	0 29
45	4 18	2 09	23 50	24 18	0 18	0 40
50	4 01	1 16	24 13	0 13	0 36	0 54
52	3 52	0 34	24 25	0 25	0 45	1 01
54	3 43	////	0 11	0 37	0 55	1 08
56	3 33	////	0 30	0 52	1 06	1 16
58	3 21	////	0 52	1 09	1 19	1 25
60	3 07	////	1 20	1 30	1 34	1 35
S						

Lat.	Sunset	Twlt. ends	Moonset 18	19	20	21
N °	h m	h m	h m	h m	h m	h m
70	13 17	17 43	□	□	15 32	14 41
68	14 01	17 46	□	□	14 53	14 22
66	14 30	17 48	□	14 57	14 26	14 07
64	14 52	17 51	14 49	14 19	14 04	13 54
62	15 09	17 53	13 56	13 51	13 47	13 43
60	15 24	17 56	13 23	13 30	13 33	13 34
58	15 36	17 58	12 59	13 13	13 21	13 26
56	15 47	18 00	12 40	12 58	13 10	13 19
54	15 56	18 02	12 24	12 45	13 01	13 12
52	16 04	18 03	12 10	12 34	12 52	13 06
50	16 12	18 06	11 57	12 24	12 45	13 01
45	16 28	18 11	11 32	12 03	12 28	12 49
40	16 41	18 15	11 12	11 46	12 15	12 40
35	16 53	18 21	10 55	11 32	12 04	12 32
30	17 03	18 26	10 40	11 19	11 53	12 24
20	17 20	18 37	10 15	10 57	11 36	12 12
10	17 35	18 48	9 53	10 39	11 21	12 00
0	17 49	19 02	9 33	10 21	11 06	11 50
10	18 03	19 18	9 12	10 03	10 52	11 39
20	18 19	19 40	8 50	9 44	10 36	11 28
30	18 36	20 07	8 25	9 22	10 18	11 15
35	18 47	20 27	8 10	9 09	10 08	11 07
40	18 59	20 51	7 52	8 53	9 56	10 58
45	19 13	21 24	7 31	8 35	9 42	10 48
50	19 31	22 20	7 04	8 13	9 24	10 36
52	19 39	23 04	6 51	8 02	9 16	10 30
54	19 48	////	6 35	7 50	9 06	10 23
56	19 59	////	6 17	7 35	8 56	10 16
58	20 11	////	5 56	7 18	8 44	10 08
60	20 25	////	5 27	6 58	8 30	9 59
S						

GCT	Equation of Time (App.—Mean) 18	19	20
h	m s	m s	m s
0	+15 01.4	+14 49.2	+14 36.2
6	+14 58.4	+14 46.1	+14 32.9
12	+14 55.4	+14 42.8	+14 29.4
18	+14 52.3	+14 39.6	+14 25.9
24	+14 49.2	+14 36.2	+14 22.4

GCT of Transit Meridian of Greenwich

DAY	Moon	Venus	Mars	Jupiter	Saturn
	h m	h m	h m	h m	h m
18	3 21	8 48	8 04	20 31	8 59
19	4 09	8 48	8 02	20 26	8 55
20	4 56	8 48	8 00	20 22	8 51
21	5 40	8 48	7 58	20 18	8 48

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb	Venus	Mars
°	′	′	′
0			
	0.5	0.2	0.1
30			
	0.5	0.2	0.1
45			
	0.5	0.1	0.0
60			
	0.5	0.1	0.0
75			
	0.5	0.0	0.0
90			

Moon's Lower Limb
Add

Alt.	18	19	20
°	′	′	′
0			
	11.9	12.0	12.2
4			
	11.9	12.0	12.3
8			
	11.9	12.0	12.3
12			
	11.9	12.1	12.3
16			
	12.0	12.1	12.4
20			
	12.1	12.2	12.4
24			
	12.2	12.3	12.5
28			
	12.2	12.4	12.6
32			
	12.4	12.5	12.7
36			
	12.5	12.6	12.8
40			
	12.6	12.7	12.9
44			
	12.7	12.8	13.0
48			
	12.9	13.0	13.2
52			
	13.1	13.1	13.3
56			
	13.2	13.3	13.5
60			
	13.4	13.5	13.6
64			
	13.6	13.6	13.8
68			
	13.8	13.8	14.0
72			
	14.0	14.0	14.1
76			
	14.2	14.2	14.3
80			
	14.4	14.4	14.5
84			
	14.6	14.6	14.7
88			
	14.7	14.7	14.8
90			

Add to table, back cover

Moon's Upper Limb
Subtract

Alt.	18	19	20
°	′	′	′
0			
	17.7	17.6	17.4
4			
	17.6	17.6	17.4
8			
	17.6	17.5	17.4
12			
	17.6	17.5	17.4
16			
	17.5	17.5	17.3
20			
	17.5	17.4	17.3
24			
	17.4	17.3	17.2
28			
	17.3	17.2	17.1
32			
	17.2	17.1	17.0
36			
	17.0	17.0	16.9
40			
	16.9	16.9	16.8
44			
	16.8	16.7	16.6
48			
	16.6	16.6	16.5
52			
	16.5	16.4	16.4
56			
	16.3	16.3	16.2
60			
	16.1	16.1	16.1
64			
	15.9	15.9	15.9
68			
	15.8	15.7	15.7
72			
	15.6	15.6	15.6
76			
	15.4	15.4	15.4
80			
	15.2	15.2	15.2
84			
	15.0	15.0	15.0
88			
	14.8	14.8	14.9
90			

Subtract from table, back cover

GCT	♈ GHA	VENUS −4.0 GHA	Dec.	MARS 1.7 GHA	Dec.	JUPITER −2.3 GHA	Dec.	SATURN 1.1 GHA	Dec.	MOON GHA	code	Dec.	code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
0	59 11.3	228 05.0	− 2 59.7	240 16.8	+ 2 11.9	54 33.6	+ 0 22.1	227 43.2	− 2 29.8	277 35.8	147	+16 39.2	−117
1	74 13.7	243 05.0	3 00.6	255 18.0	11.3	69 36.1	22.0	242 45.4	29.9	292 09.5	148	16 27.5	−118
2	89 16.2	258 05.0	01.4	270 19.1	10.8	84 38.7	22.0	257 47.6	30.0	306 43.3	147	16 15.7	−119
3	104 18.7	273 05.0	02.3	285 20.2	10.2	99 41.2	22.0	272 49.9	30.1	321 17.0	149	16 03.8	−119
4	119 21.1	288 04.9	03.2	300 21.4	09.7	114 43.8	22.0	287 52.1	30.2	335 50.9	148	15 51.9	−121
5	134 23.6	303 04.9	04.1	315 22.5	09.1	129 46.3	22.0	302 54.3	30.3	350 24.7	149	15 39.8	−121
6	149 26.1	318 04.9	− 3 05.0	330 23.6	+ 2 08.5	144 48.8	+ 0 21.9	317 56.6	− 2 30.4	4 58.6	150	+15 27.7	−121
7	164 28.5	333 04.9	05.8	345 24.8	08.0	159 51.4	21.9	332 58.8	30.5	19 32.6	149	15 15.6	−122
8	179 31.0	348 04.8	06.7	0 25.9	07.4	174 53.9	21.9	348 01.1	30.5	34 06.5	150	15 03.4	−123
9	194 33.5	3 04.8	07.6	15 27.0	06.9	189 56.5	21.9	3 03.3	30.6	48 40.5	151	14 51.1	−124
10	209 35.9	18 04.8	08.5	30 28.2	06.3	204 59.0	21.9	18 05.5	30.7	63 14.6	151	14 38.7	−124
11	224 38.4	33 04.7	09.4	45 29.3	05.7	220 01.5	21.8	33 07.8	30.8	77 48.7	151	14 26.3	−125
12	239 40.9	48 04.7	− 3 10.3	60 30.4	+ 2 05.2	235 04.1	+ 0 21.8	48 10.0	− 2 30.9	92 22.8	151	+14 13.8	−126
13	254 43.3	63 04.7	11.1	75 31.6	04.6	250 06.6	21.8	63 12.2	31.0	106 56.9	152	14 01.2	−126
14	269 45.8	78 04.7	12.0	90 32.7	04.0	265 09.2	21.8	78 14.5	31.1	121 31.1	152	13 48.6	−127
15	284 48.2	93 04.6	12.9	105 33.8	03.5	280 11.7	21.8	93 16.7	31.2	136 05.3	152	13 35.9	−128
16	299 50.7	108 04.6	13.8	120 35.0	02.9	295 14.2	21.8	108 19.0	31.2	150 39.5	153	13 23.1	−128
17	314 53.2	123 04.6	14.7	135 36.1	02.4	310 16.8	21.7	123 21.2	31.3	165 13.8	153	13 10.3	−128
18	329 55.6	138 04.5	− 3 15.6	150 37.2	+ 2 01.8	325 19.3	+ 0 21.7	138 23.4	− 2 31.4	179 48.1	153	+12 57.5	−130
19	344 58.1	153 04.5	16.4	165 38.4	01.2	340 21.8	21.7	153 25.7	31.5	194 22.4	153	12 44.5	−130
20	0 00.6	168 04.5	17.3	180 39.5	00.7	355 24.4	21.7	168 27.9	31.6	208 56.7	154	12 31.5	−130
21	15 03.0	183 04.4	18.2	195 40.6	2 00.1	10 26.9	21.7	183 30.1	31.7	223 31.1	154	12 18.5	−131
22	30 05.5	198 04.4	19.1	210 41.8	1 59.5	25 29.4	21.6	198 32.4	31.8	238 05.5	154	12 05.4	−132
23	45 08.0	213 04.4	20.0	225 42.9	59.0	40 32.0	21.6	213 34.6	31.9	252 39.9	154	11 52.2	−132
0	60 10.4	228 04.3	− 3 20.9	240 44.1	+ 1 58.4	55 34.5	+ 0 21.6	228 36.9	− 2 31.9	267 14.3	154	+11 39.0	−133
1	75 12.9	243 04.3	21.8	255 45.2	57.9	70 37.0	21.6	243 39.1	32.0	281 48.7	155	11 25.7	−134
2	90 15.4	258 04.2	22.6	270 46.3	57.3	85 39.6	21.6	258 41.3	32.1	296 23.2	155	11 12.3	−134
3	105 17.8	273 04.2	23.5	285 47.5	56.7	100 42.1	21.6	273 43.6	32.2	310 57.7	155	10 58.9	−134
4	120 20.3	288 04.2	24.4	300 48.6	56.2	115 44.6	21.5	288 45.8	32.3	325 32.2	155	10 45.5	−135
5	135 22.7	303 04.1	25.3	315 49.7	55.6	130 47.2	21.5	303 48.0	32.4	340 06.7	155	10 32.0	−136
6	150 25.2	318 04.1	− 3 26.2	330 50.9	+ 1 55.1	145 49.7	+ 0 21.5	318 50.3	− 2 32.5	354 41.2	156	+10 18.4	−136
7	165 27.7	333 04.0	27.1	345 52.0	54.5	160 52.2	21.5	333 52.5	32.6	9 15.8	155	10 04.8	−137
8	180 30.1	348 04.0	28.0	0 53.1	53.9	175 54.8	21.5	348 54.8	32.6	23 50.3	156	9 51.1	−137
9	195 32.6	3 04.0	28.9	15 54.3	53.4	190 57.3	21.5	3 57.0	32.7	38 24.9	156	9 37.4	−137
10	210 35.1	18 03.9	29.8	30 55.4	52.8	205 59.8	21.4	18 59.2	32.8	52 59.5	156	9 23.7	−138
11	225 37.5	33 03.9	30.6	45 56.6	52.3	221 02.4	21.4	34 01.5	32.9	67 34.1	156	9 09.9	−139
12	240 40.0	48 03.8	− 3 31.5	60 57.7	+ 1 51.7	236 04.9	+ 0 21.4	49 03.7	− 2 33.0	82 08.7	156	+ 8 56.0	−139
13	255 42.5	63 03.8	32.4	75 58.8	51.1	251 07.4	21.4	64 06.0	33.1	96 43.3	156	8 42.1	−140
14	270 44.9	78 03.8	33.3	91 00.0	50.6	266 10.0	21.4	79 08.2	33.2	111 17.9	156	8 28.1	−140
15	285 47.4	93 03.7	34.2	106 01.1	50.0	281 12.5	21.4	94 10.4	33.2	125 52.5	157	8 14.1	−140
16	300 49.8	108 03.7	35.1	121 02.2	49.4	296 15.0	21.3	109 12.7	33.3	140 27.2	156	8 00.1	−141
17	315 52.3	123 03.6	36.0	136 03.4	48.9	311 17.5	21.3	124 14.9	33.4	155 01.8	156	7 46.0	−142
18	330 54.8	138 03.6	− 3 36.9	151 04.5	+ 1 48.3	326 20.1	+ 0 21.3	139 17.2	− 2 33.5	169 36.4	157	+ 7 31.8	−142
19	345 57.2	153 03.5	37.8	166 05.7	47.8	341 22.6	21.3	154 19.4	33.6	184 11.1	156	7 17.6	−142
20	0 59.7	168 03.5	38.7	181 06.8	47.2	356 25.1	21.3	169 21.6	33.7	198 45.7	156	7 03.4	−143
21	16 02.2	183 03.4	39.6	196 07.9	46.6	11 27.7	21.3	184 23.9	33.8	213 20.3	156	6 49.1	−143
22	31 04.6	198 03.4	40.5	211 09.1	46.1	26 30.2	21.3	199 26.1	33.8	227 54.9	157	6 34.8	−143
23	46 07.1	213 03.3	41.4	226 10.2	45.5	41 32.7	21.2	214 28.4	33.9	242 29.6	156	6 20.5	−144
0	61 09.6	228 03.3	− 3 42.2	241 11.3	+ 1 45.0	56 35.2	+ 0 21.2	229 30.6	− 2 34.0	257 04.2	156	+ 6 06.1	−145
1	76 12.0	243 03.2	43.1	256 12.5	44.4	71 37.8	21.2	244 32.8	34.1	271 38.8	156	5 51.6	−145
2	91 14.5	258 03.2	44.0	271 13.6	43.8	86 40.3	21.2	259 35.1	34.2	286 13.4	156	5 37.1	−145
3	106 17.0	273 03.1	44.9	286 14.8	43.3	101 42.8	21.2	274 37.3	34.3	300 48.0	156	5 22.6	−145
4	121 19.4	288 03.1	45.8	301 15.9	42.7	116 45.3	21.2	289 39.6	34.4	315 22.6	155	5 08.1	−146
5	136 21.9	303 03.0	46.7	316 17.0	42.2	131 47.9	21.2	304 41.8	34.4	329 57.1	156	4 53.5	−146
6	151 24.3	318 03.0	− 3 47.6	331 18.2	+ 1 41.6	146 50.4	+ 0 21.1	319 44.0	− 2 34.5	344 31.7	156	+ 4 38.9	−147
7	166 26.8	333 02.9	48.5	346 19.3	41.0	161 52.9	21.1	334 46.3	34.6	359 06.3	155	4 24.2	−147
8	181 29.3	348 02.9	49.4	1 20.5	40.5	176 55.4	21.1	349 48.5	34.7	13 40.8	155	4 09.5	−147
9	196 31.7	3 02.8	50.3	16 21.6	39.9	191 58.0	21.1	4 50.8	34.8	28 15.3	155	3 54.8	−148
10	211 34.2	18 02.8	51.2	31 22.7	39.4	207 00.5	21.1	19 53.0	34.9	42 49.8	155	3 40.0	−148
11	226 36.7	33 02.7	52.1	46 23.9	38.8	222 03.0	21.1	34 55.3	35.0	57 24.3	154	3 25.2	−148
12	241 39.1	48 02.7	− 3 53.0	61 25.0	+ 1 38.2	237 05.5	+ 0 21.1	49 57.5	− 2 35.0	71 58.7	155	+ 3 10.4	−149
13	256 41.6	63 02.6	53.9	76 26.2	37.7	252 08.0	21.1	64 59.7	35.1	86 33.2	154	2 55.5	−149
14	271 44.1	78 02.5	54.8	91 27.3	37.1	267 10.6	21.0	80 02.0	35.2	101 07.6	154	2 40.6	−149
15	286 46.5	93 02.5	55.7	106 28.4	36.6	282 13.1	21.0	95 04.2	35.3	115 42.0	154	2 25.7	−149
16	301 49.0	108 02.4	56.6	121 29.6	36.0	297 15.6	21.0	110 06.5	35.4	130 16.4	153	2 10.8	−150
17	316 51.4	123 02.4	57.5	136 30.7	35.4	312 18.1	21.0	125 08.7	35.5	144 50.7	153	1 55.8	−150
18	331 53.9	138 02.3	− 3 58.4	151 31.9	+ 1 34.9	327 20.6	+ 0 21.0	140 11.0	− 2 35.6	159 25.0	153	+ 1 40.8	−150
19	346 56.4	153 02.3	3 59.3	166 33.0	34.3	342 23.2	21.0	155 13.2	35.6	173 59.3	153	1 25.8	−151
20	1 58.8	168 02.2	4 00.2	181 34.1	33.8	357 25.7	21.0	170 15.4	35.7	188 33.6	152	1 10.7	−150
21	17 01.3	183 02.1	01.1	196 35.3	33.2	12 28.2	21.0	185 17.7	35.8	203 07.8	152	0 55.7	−151
22	32 03.8	198 02.1	02.0	211 36.4	32.6	27 30.7	21.0	200 19.9	35.9	217 42.0	152	0 40.6	−152
23	47 06.2	213 02.0	02.9	226 37.6	32.1	42 33.2	20.9	215 22.2	36.0	232 16.2	151	0 25.4	−151
24	62 08.7	228 02.0	− 4 03.8	241 38.7	+ 1 31.5	57 35.8	+ 0 20.9	230 24.4	− 2 36.1	246 50.3	151	+ 0 10.3	−152
code	—	0	− 9	+ 11	− 6	+ 25	0	+ 23	− 1				

SUN

GCT h	GHA ° ′	Dec. ° ′
0	183 35.5	−19 41.4
1	198 35.4	41.9
2	213 35.2	42.5
3	228 35.1	·· 43.1
4	243 34.9	43.6
5	258 34.8	44.2
6	273 34.6	−19 44.8
7	288 34.5	45.3
8	303 34.3	45.9
9	318 34.2	·· 46.5
10	333 34.0	47.0
11	348 33.9	47.6
12	3 33.7	−19 48.1
13	18 33.6	48.7
14	33 33.4	49.3
15	48 33.3	·· 49.8
16	63 33.1	50.4
17	78 32.9	50.9
18	93 32.8	−19 51.5
19	108 32.6	52.1
20	123 32.5	52.6
21	138 32.3	·· 53.2
22	153 32.2	53.7
23	168 32.0	54.3
0	183 31.9	−19 54.8
1	198 31.7	55.4
2	213 31.5	55.9
3	228 31.4	·· 56.5
4	243 31.2	57.0
5	258 31.1	57.6
6	273 30.9	−19 58.1
7	288 30.7	58.7
8	303 30.6	59.2
9	318 30.4	·19 59.8
10	333 30.3	20 00.3
11	348 30.1	00.9
12	3 29.9	−20 01.4
13	18 29.8	02.0
14	33 29.6	02.5
15	48 29.5	·· 03.0
16	63 29.3	03.6
17	78 29.1	04.1
18	93 29.0	−20 04.7
19	108 28.8	05.2
20	123 28.6	05.8
21	138 28.5	·· 06.3
22	153 28.3	06.8
23	168 28.1	07.4
0	183 28.0	−20 07.9
1	198 27.8	08.4
2	213 27.6	09.0
3	228 27.5	·· 09.5
4	243 27.3	10.1
5	258 27.1	10.6
6	273 27.0	−20 11.1
7	288 26.8	11.7
8	303 26.6	12.2
9	318 26.5	·· 12.7
10	333 26.3	13.3
11	348 26.1	13.8
12	3 26.0	−20 14.3
13	18 25.8	14.8
14	33 25.6	15.4
15	48 25.5	·· 15.9
16	63 25.3	16.4
17	78 25.1	17.0
18	93 24.9	−20 17.5
19	108 24.8	18.0
20	123 24.6	18.5
21	138 24.4	·· 19.1
22	153 24.2	19.6
23	168 24.1	20.1
24	183 23.9	−20 20.6
code	—	− 6

STARS

No.	SHA ° ′	Dec. ° ′	Transit Mer. Gr. h m
1	358 31.4	+28 49.7	20 02
2	358 20.9	+58 53.4	20 03
3	349 42.0	−18 15.0	20 37
4	339 19.9	+59 59.5	21 18
5	336 00.4	−57 28.9	21 32
6	332 18.5	+89 02.6	21 46
7	328 52.8	+23 14.4	22 00
8	315 52.9	−40 29.7	22 52
9	309 46.3	+49 41.7	23 16
10	291 42.2	+16 25.0	0 32
11	281 56.2	− 8 15.1	1 11
12	281 42.5	+45 57.2	1 12
13	279 21.4	+ 6 18.7	1 22
14	279 10.8	+28 34.3	1 22
15	276 33.0	− 1 13.7	1 33
16	271 51.1	+ 7 24.2	1 52
17	264 16.3	−52 39.8	2 22
18	259 14.2	−16 38.7	2 42
19	255 48.7	−28 54.0	2 56
20	245 47.9	+ 5 21.1	3 36
21	244 24.0	+28 08.7	3 41
22	234 36.9	−59 20.9	4 20
23	223 26.6	−43 13.9	5 05
24	221 49.8	−69 30.7	5 11
25	218 41.5	− 8 26.8	5 24
26	208 32.7	+12 12.2	6 04
27	194 48.2	+62 00.4	6 59
28	183 20.9	+14 50.4	7 45
29	174 01.9	−62 49.7	8 22
30	172 53.2	−56 50.4	8 26
31	168 47.1	−59 25.4	8 43
32	167 01.4	+56 13.0	8 50
33	159 30.3	+55 10.3	9 20
34	159 20.4	−10 54.6	9 20
35	153 35.5	+49 33.0	9 43
36	149 02.7	−36 08.0	10 01
37	146 38.2	+19 25.8	10 11
38	140 56.0	−60 38.3	10 34
39	137 18.5	+74 20.9	10 48
40	126 50.5	+26 52.4	11 30
41	120 38.0	−22 29.2	11 55
42	113 23.5	−26 19.7	12 24
43	109 07.6	−68 56.7	12 41
44	103 06.0	−15 40.1	13 05
45	97 25.2	−37 04.4	13 27
46	96 49.7	+12 35.6	13 30
47	91 08.1	+51 29.7	13 52
48	84 45.5	−34 24.7	14 18
49	81 10.7	+38 44.3	14 32
50	76 55.9	−26 21.7	14 49
51	62 53.6	+ 8 44.4	15 45
52	54 32.2	−56 53.8	16 18
53	50 03.3	+45 06.7	16 36
54	34 32.6	+ 9 39.3	17 38
55	28 41.6	−47 11.9	18 02
56	16 14.8	−29 52.8	18 51
57	14 24.4	+14 56.9	18 59

Sunrise, Twilight, Moonrise

Lat. °	Sunrise h m	Twlt. begins h m	Moonrise 21 h m	22 h m	23 h m	24 h m
N 70	10 38	5 52	21 44	23 43	25 40	1 40
68	9 44	5 49	22 01	23 51	25 39	1 39
66	9 11	5 46	22 15	23 57	25 39	1 39
64	8 47	5 43	22 26	24 02	0 02	1 39
62	8 29	5 40	22 36	24 07	0 07	1 38
60	8 13	5 38	22 44	24 10	0 10	1 38
58	8 00	5 35	22 51	24 14	0 14	1 38
56	7 49	5 33	22 57	24 17	0 17	1 38
54	7 39	5 32	23 03	24 20	0 20	1 38
52	7 31	5 29	23 08	24 22	0 22	1 38
50	7 23	5 27	23 13	24 24	0 24	1 37
45	7 06	5 22	23 23	24 29	0 29	1 37
40	6 52	5 16	23 31	24 33	0 33	1 37
35	6 41	5 12	23 38	24 37	0 37	1 37
30	6 30	5 06	23 44	24 40	0 40	1 37
20	6 13	4 55	23 54	24 45	0 45	1 36
10	5 57	4 43	24 03	0 03	0 49	1 36
0	5 42	4 29	24 12	0 12	0 54	1 36
10	5 28	4 12	24 20	0 20	0 58	1 36
20	5 12	3 51	24 29	0 29	1 03	1 36
30	4 53	3 21	0 10	0 40	1 08	1 35
35	4 42	3 03	0 19	0 46	1 11	1 35
40	4 30	2 37	0 29	0 52	1 14	1 35
45	4 15	2 03	0 40	1 00	1 18	1 35
50	3 57	1 04	0 54	1 09	1 22	1 35
52	3 48	0 00	1 01	1 14	1 25	1 35
54	3 39	////	1 08	1 18	1 27	1 35
56	3 28	////	1 16	1 24	1 29	1 35
58	3 15	////	1 25	1 29	1 32	1 35
S 60	3 01	////	1 35	1 36	1 35	1 35

Sunset, Twilight, Moonset

Lat. °	Sunset h m	Twlt. ends h m	Moonset 21 h m	22 h m	23 h m	24 h m
N 70	12 53	17 37	14 41	14 10	13 44	13 19
68	13 48	17 40	14 22	14 00	13 41	13 23
66	14 20	17 43	14 07	13 52	13 39	13 26
64	14 44	17 46	13 54	13 45	13 37	13 28
62	15 03	17 49	13 43	13 39	13 35	13 31
60	15 18	17 52	13 34	13 34	13 33	13 33
58	15 31	17 54	13 26	13 29	13 32	13 34
56	15 42	17 56	13 19	13 25	13 30	13 36
54	15 52	17 59	13 12	13 21	13 29	13 37
52	16 01	18 01	13 06	13 18	13 28	13 39
50	16 09	18 04	13 01	13 15	13 27	13 40
45	16 26	18 09	12 49	13 08	13 25	13 43
40	16 39	18 14	12 40	13 02	13 23	13 45
35	16 51	18 19	12 32	12 57	13 22	13 47
30	17 01	18 24	12 24	12 53	13 20	13 48
20	17 19	18 36	12 12	12 45	13 18	13 51
10	17 35	18 49	12 00	12 38	13 16	13 54
0	17 50	19 03	11 50	12 32	13 14	13 56
10	18 04	19 20	11 39	12 25	13 12	13 59
20	18 20	19 41	11 28	12 18	13 09	14 02
30	18 39	20 11	11 15	12 11	13 07	14 05
35	18 50	20 31	11 07	12 06	13 05	14 06
40	19 02	20 56	10 58	12 01	13 04	14 08
45	19 17	21 31	10 48	11 54	13 01	14 10
50	19 36	22 33	10 36	11 47	12 59	14 13
52	19 44	////	10 30	11 44	12 58	14 14
54	19 54	////	10 23	11 40	12 57	14 16
56	20 05	////	10 16	11 35	12 55	14 17
58	20 18	////	10 08	11 31	12 54	14 19
S 60	20 33	////	9 59	11 25	12 52	14 21

Equation of Time (App.—Mean)

GCT h	21 m s	22 m s	23 m s
0	+14 22.4	+14 07.7	+13 52.3
6	+14 18.8	+14 03.9	+13 48.3
12	+14 15.2	+14 00.1	+13 44.2
18	+14 11.5	+13 56.2	+13 40.1
24	+14 07.7	+13 52.3	+13 36.0

GCT of Transit Meridian of Greenwich

DAY	Moon h m	Venus h m	Mars h m	Jupiter h m	Saturn h m
21	5 40	8 48	7 58	20 18	8 48
22	6 22	8 48	7 57	20 14	8 44
23	7 04	8 48	7 55	20 10	8 41
24	7 46	8 48	7 53	20 06	8 37

ADDITIONAL ALTITUDE CORRECTIONS

Alt. °	Sun's Low'r Limb ′	Venus ′	Mars ′
0			
	0.5	0.2	0.1
30			
	0.5	0.2	0.1
45			
	0.5	0.1	0.0
60			
	0.5	0.1	0.0
75			
	0.5	0.0	0.0
90			

Moon's Lower Limb
Add

Alt. °	21 ′	22 ′	23 ′
0			
	12.8	13.5	14.4
4			
	12.8	13.5	14.4
8			
	12.8	13.5	14.4
12			
	12.8	13.6	14.4
16			
	12.9	13.6	14.5
20			
	12.9	13.6	14.5
24			
	13.0	13.7	14.5
28			
	13.0	13.7	14.5
32			
	13.1	13.8	14.6
36			
	13.2	13.9	14.6
40			
	13.3	13.9	14.6
44			
	13.4	14.0	14.7
48			
	13.5	14.1	14.7
52			
	13.7	14.2	14.8
56			
	13.8	14.3	14.8
60			
	13.9	14.4	14.9
64			
	14.1	14.5	14.9
68			
	14.2	14.6	15.0
72			
	14.3	14.7	15.1
76			
	14.5	14.8	15.1
80			
	14.6	14.9	15.2
84			
	14.8	15.0	15.2
88			
	14.9	15.1	15.3
90			

Add to table, back cover

Moon's Upper Limb
Subtract

Alt. °	21 ′	22 ′	23 ′
0			
	17.2	16.7	16.2
4			
	17.1	16.7	16.2
8			
	17.1	16.7	16.2
12			
	17.1	16.7	16.2
16			
	17.0	16.6	16.2
20			
	17.0	16.6	16.1
24			
	16.9	16.6	16.1
28			
	16.9	16.5	16.1
32			
	16.8	16.4	16.1
36			
	16.7	16.4	16.0
40			
	16.6	16.3	16.0
44			
	16.5	16.2	15.9
48			
	16.4	16.1	15.9
52			
	16.2	16.1	15.8
56			
	16.1	16.0	15.8
60			
	16.0	15.9	15.7
64			
	15.8	15.8	15.7
68			
	15.7	15.7	15.6
72			
	15.6	15.6	15.6
76			
	15.4	15.4	15.5
80			
	15.3	15.3	15.4
84			
	15.1	15.2	15.4
88			
	15.0	15.1	15.3
90			

Subtract from table, back cover

Last Quarter 21
Thanksgiving Day 22

GCT	♈	VENUS −4.0		MARS 1.7		JUPITER −2.3		SATURN 1.1		MOON			
	GHA	GHA	Dec.	GHA	Dec.	GHA	Dec.	GHA	Dec.	GHA	code	Dec.	code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
0	62 08.7	228 02.0	− 4 03.8	241 38.7	+ 1 31.5	57 35.8	+ 0 20.9	230 24.4	− 2 36.1	246 50.3	151	+ 0 10.3	−152
1	77 11.2	243 01.9	04.7	256 39.8	31.0	72 38.3	20.9	245 26.7	36.2	261 24.4	150	− 0 04.9	−151
2	92 13.6	258 01.8	05.6	271 41.0	30.4	87 40.8	20.9	260 28.9	36.2	275 58.4	150	0 20.0	−152
3	107 16.1	273 01.8	·· 06.5	286 42.1	·· 29.9	102 43.3	·· 20.9	275 31.1	·· 36.3	290 32.4	150	· 0 35.2	−153
4	122 18.6	288 01.7	07.4	301 43.3	29.3	117 45.8	20.9	290 33.4	36.4	305 06.4	149	0 50.5	−152
5	137 21.0	303 01.6	08.3	316 44.4	28.7	132 48.3	20.9	305 35.6	36.5	319 40.3	149	1 05.7	−152
6	152 23.5	318 01.6	− 4 09.2	331 45.5	+ 1 28.2	147 50.9	+ 0 20.9	320 37.9	− 2 36.6	334 14.2	149	− 1 20.9	−153
7	167 25.9	333 01.5	10.1	346 46.7	27.6	162 53.4	20.9	335 40.1	36.7	348 48.1	148	1 36.2	−153
8	182 28.4	348 01.4	11.0	1 47.8	27.1	177 55.9	20.9	350 42.4	36.7	3 21.9	147	1 51.5	−153
9	197 30.9	3 01.4	·· 11.9	16 49.0	·· 26.5	192 58.4	·· 20.8	5 44.6	·· 36.8	17 55.6	147	· 2 06.8	−153
10	212 33.3	18 01.3	12.8	31 50.1	25.9	208 00.9	20.8	20 46.8	36.9	32 29.3	147	2 22.1	−153
11	227 35.8	33 01.2	13.7	46 51.3	25.4	223 03.4	20.8	35 49.1	37.0	47 03.0	146	2 37.4	−153
12	242 38.3	48 01.2	− 4 14.6	61 52.4	+ 1 24.8	238 06.0	+ 0 20.8	50 51.3	− 2 37.1	61 36.6	145	− 2 52.7	−153
13	257 40.7	63 01.1	15.5	76 53.5	24.3	253 08.5	20.8	65 53.6	37.2	76 10.1	145	3 08.0	−154
14	272 43.2	78 01.0	16.4	91 54.7	23.7	268 11.0	20.8	80 55.8	37.3	90 43.6	144	3 23.4	−153
15	287 45.7	93 01.0	·· 17.3	106 55.8	·· 23.1	283 13.5	·· 20.8	95 58.1	·· 37.3	105 17.0	144	· 3 38.7	−154
16	302 48.1	108 00.9	18.2	121 57.0	22.6	298 16.0	20.8	111 00.3	37.4	119 50.4	144	3 54.1	−153
17	317 50.6	123 00.8	19.1	136 58.1	22.0	313 18.5	20.8	126 02.6	37.5	134 23.8	142	4 09.4	−154
18	332 53.1	138 00.7	− 4 20.0	151 59.3	+ 1 21.5	328 21.0	+ 0 20.8	141 04.8	− 2 37.6	148 57.0	142	− 4 24.8	−153
19	347 55.5	153 00.7	21.0	167 00.4	20.9	343 23.5	20.8	156 07.0	37.7	163 30.2	142	4 40.1	−154
20	2 58.0	168 00.6	21.9	182 01.5	20.4	358 26.1	20.8	171 09.3	37.8	178 03.4	140	4 55.5	−153
21	18 00.4	183 00.5	·· 22.8	197 02.7	·· 19.8	13 28.6	·· 20.7	186 11.5	·· 37.8	192 36.4	140	· 5 10.8	−154
22	33 02.9	198 00.5	23.7	212 03.8	19.2	28 31.1	20.7	201 13.8	37.9	207 09.4	140	5 26.2	−154
23	48 05.4	213 00.4	24.6	227 05.0	18.7	43 33.6	20.7	216 16.0	38.0	221 42.4	139	5 41.6	−153
0	63 07.8	228 00.3	− 4 25.5	242 06.1	+ 1 18.1	58 36.1	+ 0 20.7	231 18.3	− 2 38.1	236 15.3	138	− 5 56.9	−153
1	78 10.3	243 00.2	26.4	257 07.3	17.6	73 38.6	20.7	246 20.5	38.2	250 48.1	137	6 12.2	−154
2	93 12.8	258 00.2	27.3	272 08.4	17.0	88 41.1	20.7	261 22.8	38.3	265 20.8	137	6 27.6	−153
3	108 15.2	273 00.1	·· 28.2	287 09.5	·· 16.4	103 43.6	·· 20.7	276 25.0	·· 38.3	279 53.5	136	· 6 42.9	−153
4	123 17.7	288 00.0	29.1	302 10.7	15.9	118 46.1	20.7	291 27.2	38.4	294 26.1	135	6 58.2	−154
5	138 20.2	302 59.9	30.0	317 11.8	15.3	133 48.7	20.7	306 29.5	38.5	308 58.6	134	7 13.6	−153
6	153 22.6	317 59.8	− 4 30.9	332 13.0	+ 1 14.8	148 51.2	+ 0 20.7	321 31.7	− 2 38.6	323 31.0	134	− 7 28.9	−153
7	168 25.1	332 59.8	31.8	347 14.1	14.2	163 53.7	20.7	336 34.0	38.7	338 03.4	132	7 44.2	−152
8	183 27.5	347 59.7	32.7	2 15.3	13.7	178 56.2	20.7	351 36.2	38.8	352 35.6	132	7 59.4	−153
9	198 30.0	2 59.6	·· 33.7	17 16.4	·· 13.1	193 58.7	·· 20.7	6 38.5	·· 38.8	7 07.8	132	· 8 14.7	−152
10	213 32.5	17 59.5	34.6	32 17.6	12.5	209 01.2	20.7	21 40.7	38.9	21 40.0	130	8 29.9	−153
11	228 34.9	32 59.5	35.5	47 18.7	12.0	224 03.7	20.7	36 43.0	39.0	36 12.0	130	8 45.2	−152
12	243 37.4	47 59.4	− 4 36.4	62 19.8	+ 1 11.4	239 06.2	+ 0 20.6	51 45.2	− 2 39.1	50 44.0	128	− 9 00.4	−152
13	258 39.9	62 59.3	37.3	77 21.0	10.9	254 08.7	20.6	66 47.5	39.2	65 15.8	128	9 15.6	−151
14	273 42.3	77 59.2	38.2	92 22.1	10.3	269 11.2	20.6	81 49.7	39.3	79 47.6	127	9 30.7	−152
15	288 44.8	92 59.1	·· 39.1	107 23.3	·· 09.8	284 13.7	·· 20.6	96 52.0	·· 39.3	94 19.3	126	· 9 45.9	−151
16	303 47.3	107 59.0	40.0	122 24.4	09.2	299 16.2	20.6	111 54.2	39.4	108 50.9	125	10 01.0	−151
17	318 49.7	122 59.0	40.9	137 25.6	08.6	314 18.7	20.6	126 56.5	39.5	123 22.4	124	10 16.1	−150
18	333 52.2	137 58.9	− 4 41.8	152 26.7	+ 1 08.1	329 21.2	+ 0 20.6	141 58.7	− 2 39.6	137 53.8	123	−10 31.1	−151
19	348 54.7	152 58.8	42.8	167 27.9	07.5	344 23.7	20.6	157 00.9	39.7	152 25.1	122	10 46.2	−150
20	3 57.1	167 58.7	43.7	182 29.0	07.0	359 26.2	20.6	172 03.2	39.8	166 56.3	122	11 01.2	−149
21	18 59.6	182 58.6	·· 44.6	197 30.2	·· 06.4	14 28.8	·· 20.6	187 05.4	·· 39.8	181 27.5	120	·11 16.1	−150
22	34 02.0	197 58.5	45.5	212 31.3	05.9	29 31.3	20.6	202 07.7	39.9	195 58.5	119	11 31.1	−149
23	49 04.5	212 58.5	46.4	227 32.5	05.3	44 33.8	20.6	217 09.9	40.0	210 29.4	118	11 46.0	−148
0	64 07.0	227 58.4	− 4 47.3	242 33.6	+ 1 04.7	59 36.3	+ 0 20.6	232 12.2	− 2 40.1	225 00.2	118	−12 00.8	−148
1	79 09.4	242 58.3	48.2	257 34.7	04.2	74 38.8	20.6	247 14.4	40.2	239 31.0	116	12 15.6	−148
2	94 11.9	257 58.2	49.1	272 35.9	03.6	89 41.3	20.6	262 16.7	40.2	254 01.6	115	12 30.4	−148
3	109 14.4	272 58.1	·· 50.1	287 37.0	·· 03.1	104 43.8	·· 20.6	277 18.9	·· 40.3	268 32.1	114	·12 45.2	−147
4	124 16.8	287 58.0	51.0	302 38.2	02.5	119 46.3	20.6	292 21.2	40.4	283 02.5	113	12 59.9	−146
5	139 19.3	302 57.9	51.9	317 39.3	02.0	134 48.8	20.6	307 23.4	40.5	297 32.8	112	13 14.5	−146
6	154 21.8	317 57.8	− 4 52.8	332 40.5	+ 1 01.4	149 51.3	+ 0 20.6	322 25.7	− 2 40.6	312 03.0	111	−13 29.1	−145
7	169 24.2	332 57.7	53.7	347 41.6	00.8	164 53.8	20.6	337 27.9	40.7	326 33.1	109	13 43.6	−145
8	184 26.7	347 57.7	54.6	2 42.8	1 00.3	179 56.3	20.6	352 30.2	40.7	341 03.0	109	13 58.1	−145
9	199 29.2	2 57.6	·· 55.5	17 43.9	· 0 59.7	194 58.8	·· 20.6	7 32.4	·· 40.8	355 32.9	107	·14 12.6	−144
10	214 31.6	17 57.5	56.5	32 45.1	59.2	210 01.3	20.6	22 34.7	40.9	10 02.6	107	14 27.0	−143
11	229 34.1	32 57.4	57.4	47 46.2	58.6	225 03.8	20.6	37 36.9	41.0	24 32.3	105	14 41.3	−143
12	244 36.5	47 57.3	− 4 58.3	62 47.4	+ 0 58.1	240 06.3	+ 0 20.6	52 39.2	− 2 41.1	39 01.8	104	−14 55.6	−142
13	259 39.0	62 57.2	4 59.2	77 48.5	57.5	255 08.8	20.6	67 41.4	41.1	53 31.2	103	15 09.8	−142
14	274 41.5	77 57.1	5 00.1	92 49.7	56.9	270 11.3	20.6	82 43.7	41.2	68 00.5	101	15 24.0	−141
15	289 43.9	92 57.0	·· 01.0	107 50.8	·· 56.4	285 13.8	·· 20.6	97 45.9	·· 41.3	82 29.6	101	·15 38.1	−140
16	304 46.4	107 56.9	01.9	122 52.0	55.8	300 16.3	20.6	112 48.2	41.4	96 58.7	99	15 52.1	−139
17	319 48.9	122 56.8	02.9	137 53.1	55.3	315 18.8	20.6	127 50.4	41.5	111 27.6	98	16 06.0	−139
18	334 51.3	137 56.7	− 5 03.8	152 54.3	+ 0 54.7	330 21.3	+ 0 20.6	142 52.7	− 2 41.6	125 56.4	96	−16 19.9	−138
19	349 53.8	152 56.6	04.7	167 55.4	54.2	345 23.7	20.6	157 54.9	41.6	140 25.0	96	16 33.7	−138
20	4 56.3	167 56.5	05.6	182 56.6	53.6	0 26.2	20.6	172 57.2	41.7	154 53.6	94	16 47.5	−136
21	19 58.7	182 56.4	·· 06.5	197 57.7	·· 53.1	15 28.7	·· 20.6	187 59.4	·· 41.8	169 22.0	93	·17 01.1	−136
22	35 01.2	197 56.3	07.4	212 58.9	52.5	30 31.2	20.6	203 01.7	41.9	183 50.3	92	17 14.7	−135
23	50 03.7	212 56.2	08.4	228 00.0	51.9	45 33.7	20.6	218 03.9	42.0	198 18.5	90	17 28.2	−135
24	65 06.1	227 56.1	− 5 09.3	243 01.2	+ 0 51.4	60 36.2	+ 0 20.6	233 06.2	− 2 42.0	212 46.5	89	−17 41.7	−133
code	—	− 1	− 9	+ 12	− 5	+ 25	0	+ 23	− 1				

GCT	SUN GHA	SUN Dec.
h	° ′	° ′
0	183 23.9	−20 20.6
1	198 23.7	21.1
2	213 23.6	21.7
3	228 23.4 ··	22.2
4	243 23.2	22.7
5	258 23.0	23.2
6	273 22.8	−20 23.7
7	288 22.7	24.3
8	303 22.5	24.8
9	318 22.3 ··	25.3
10	333 22.1	25.8
11	348 22.0	26.3
12	3 21.8	−20 26.8
13	18 21.6	27.4
14	33 21.4	27.9
15	48 21.2 ··	28.4
16	63 21.1	28.9
17	78 20.9	29.4
18	93 20.7	−20 29.9
19	108 20.5	30.4
20	123 20.3	30.9
21	138 20.2 ··	31.4
22	153 20.0	32.0
23	168 19.8	32.5
0	183 19.6	−20 33.0
1	198 19.4	33.5
2	213 19.3	34.0
3	228 19.1 ··	34.5
4	243 18.9	35.0
5	258 18.7	35.5
6	273 18.5	−20 36.0
7	288 18.3	36.5
8	303 18.2	37.0
9	318 18.0 ··	37.5
10	333 17.8	38.0
11	348 17.6	38.5
12	3 17.4	−20 39.0
13	18 17.2	39.5
14	33 17.0	40.0
15	48 16.8 ··	40.5
16	63 16.7	41.0
17	78 16.5	41.5
18	93 16.3	−20 42.0
19	108 16.1	42.5
20	123 15.9	43.0
21	138 15.7 ··	43.4
22	153 15.5	43.9
23	168 15.3	44.4
0	183 15.1	−20 44.9
1	198 15.0	45.4
2	213 14.8	45.9
3	228 14.6 ··	46.4
4	243 14.4	46.9
5	258 14.2	47.4
6	273 14.0	−20 47.9
7	288 13.8	48.3
8	303 13.6	48.8
9	318 13.4 ··	49.3
10	333 13.2	49.8
11	348 13.0	50.3
12	3 12.8	−20 50.8
13	18 12.6	51.2
14	33 12.4	51.7
15	48 12.2 ··	52.2
16	63 12.1	52.7
17	78 11.9	53.2
18	93 11.7	−20 53.6
19	108 11.5	54.1
20	123 11.3	54.6
21	138 11.1 ··	55.1
22	153 10.9	55.5
23	168 10.7	56.0
24	183 10.5	−20 56.5
code	—	− 5

No.	STARS SHA	Dec.	Transit Mer. Gr.
	° ′	° ′	h m
1	358 31.4	+28 49.7	19 50
2	358 20.9	+58 53.4	19 51
3	349 42.0	−18 15.0	20 25
4	339 19.9	+59 59.5	21 07
5	336 00.4	−57 28.9	21 20
6	332 18.9	+89 02.6	21 35
7	328 52.8	+23 14.4	21 48
8	315 52.9	−40 29.7	22 40
9	309 46.3	+49 41.7	23 05
10	291 42.2	+16 25.0	0 21
11	281 56.2	− 8 15.1	1 00
12	281 42.5	+45 57.2	1 00
13	279 21.3	+ 6 18.7	1 10
14	279 10.8	+28 34.3	1 11
15	276 33.0	− 1 13.7	1 21
16	271 51.1	+ 7 24.2	1 40
17	264 16.3	−52 39.8	2 10
18	259 14.2	−16 38.7	2 30
19	255 48.6	−28 54.0	2 44
20	245 47.9	+ 5 21.1	3 24
21	244 24.0	+28 08.7	3 29
22	234 36.9	−59 20.9	4 08
23	223 26.5	−43 13.9	4 53
24	221 49.8	−69 30.7	4 59
25	218 41.5	− 8 26.8	5 12
26	208 32.7	+12 12.2	5 52
27	194 48.2	+62 00.4	6 47
28	183 20.9	+14 50.4	7 33
29	174 01.9	−62 49.7	8 10
30	172 53.2	−56 50.4	8 15
31	168 47.1	−59 25.4	8 31
32	167 01.3	+56 13.0	8 38
33	159 30.3	+55 10.3	9 08
34	159 20.4	−10 54.6	9 09
35	153 35.5	+49 33.0	9 32
36	149 02.7	−36 08.0	9 50
37	146 38.2	+19 25.8	9 59
38	140 56.0	−60 38.3	10 22
39	137 18.5	+74 20.9	10 37
40	126 50.5	+26 52.4	11 18
41	120 38.0	−22 29.2	11 43
42	113 23.5	−26 19.7	12 12
43	109 07.6	−68 56.7	12 29
44	103 06.0	−15 40.1	12 53
45	97 25.2	−37 04.4	13 16
46	96 49.7	+12 35.6	13 18
47	91 08.1	+51 29.7	13 41
48	84 45.5	−34 24.7	14 06
49	81 10.7	+38 44.3	14 20
50	76 55.9	−26 21.7	14 37
51	62 53.6	+ 8 44.4	15 33
52	54 32.2	−56 53.8	16 07
53	50 03.4	+45 06.6	16 25
54	34 32.6	+ 9 39.3	17 26
55	28 41.6	−47 11.9	17 50
56	16 14.8	−29 52.8	18 39
57	14 24.4	+14 56.9	18 47

Lat.	Sunrise	Twlt. begins	Moonrise 24	25	26	27
N °	h m	h m	h m	h m	h m	h m
70	11 16	6 00	1 40	3 41	5 59	■
68	9 59	5 56	1 39	3 32	5 38	8 15
66	9 22	5 53	1 39	3 25	5 21	7 36
64	8 57	5 50	1 39	3 19	5 07	7 10
62	8 37	5 46	1 38	3 14	4 56	6 49
60	8 20	5 43	1 38	3 09	4 46	6 32
58	8 07	5 41	1 38	3 05	4 38	6 18
56	7 55	5 38	1 38	3 02	4 31	6 06
54	7 45	5 36	1 38	2 59	4 24	5 56
52	7 35	5 33	1 38	2 56	4 19	5 47
50	7 27	5 31	1 37	2 53	4 13	5 39
45	7 10	5 25	1 37	2 48	4 02	5 21
40	6 56	5 19	1 37	2 43	3 53	5 07
35	6 43	5 13	1 37	2 39	3 45	4 55
30	6 33	5 08	1 37	2 36	3 38	4 45
20	6 14	4 57	1 36	2 30	3 26	4 28
10	5 58	4 44	1 36	2 25	3 16	4 12
0	5 43	4 30	1 36	2 20	3 07	3 58
10	5 28	4 12	1 36	2 15	2 57	3 44
20	5 11	3 50	1 36	2 10	2 47	3 29
30	4 52	3 20	1 35	2 04	2 36	3 12
35	4 41	3 00	1 35	2 01	2 30	3 03
40	4 28	2 34	1 35	1 57	2 22	2 51
45	4 13	1 58	1 35	1 53	2 14	2 38
50	3 54	0 52	1 35	1 48	2 04	2 23
52	3 45	////	1 35	1 46	1 59	2 15
54	3 35	////	1 35	1 44	1 54	2 07
56	3 24	////	1 35	1 41	1 48	1 58
58	3 11	////	1 35	1 38	1 42	1 48
60	2 55	////	1 35	1 35	1 35	1 36
S						

Lat.	Sunset	Twlt. ends	Moonset 24	25	26	27
N °	h m	h m	h m	h m	h m	h m
70	12 17	17 31	13 19	12 51	12 13	■
68	13 34	17 35	13 23	13 02	12 36	11 48
66	14 11	17 39	13 26	13 12	12 54	12 28
64	14 36	17 42	13 28	13 19	13 09	12 56
62	14 56	17 45	13 31	13 26	13 22	13 17
60	15 13	17 49	13 33	13 32	13 33	13 35
58	15 26	17 51	13 34	13 38	13 42	13 50
56	15 38	17 54	13 36	13 42	13 50	14 02
54	15 49	17 57	13 37	13 47	13 58	14 13
52	15 58	17 59	13 39	13 50	14 04	14 23
50	16 06	18 01	13 40	13 54	14 11	14 32
45	16 24	18 08	13 43	14 02	14 23	14 51
40	16 38	18 13	13 45	14 08	14 34	15 07
35	16 50	18 19	13 47	14 14	14 44	15 20
30	17 01	18 25	13 48	14 18	14 52	15 31
20	17 19	18 36	13 51	14 27	15 06	15 51
10	17 35	18 49	13 54	14 35	15 19	16 08
0	17 51	19 05	13 56	14 42	15 31	16 24
10	18 06	19 22	13 59	14 49	15 42	16 41
20	18 22	19 44	14 02	14 56	15 55	16 58
30	18 41	20 14	14 05	15 05	16 10	17 18
35	18 53	20 35	14 06	15 10	16 18	17 30
40	19 06	21 01	14 08	15 16	16 28	17 44
45	19 21	21 38	14 10	15 23	16 39	18 00
50	19 40	22 46	14 13	15 31	16 53	18 20
52	19 49	////	14 14	15 35	17 00	18 30
54	19 59	////	14 16	15 39	17 07	18 41
56	20 11	////	14 17	15 43	17 15	18 53
58	20 24	////	14 19	15 48	17 25	19 08
60	20 40	////	14 21	15 54	17 35	19 25
S						

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb	Venus	Mars
°	′	′	′
0			
	0.5	0.2	0.1
30			
	0.5	0.2	0.1
45			
	0.5	0.1	0.0
60			
	0.5	0.1	0.0
75			
	0.5	0.0	0.0
90			

Moon's Lower Limb
Add

Alt.	24	25	26
°	′	′	′
0			
	15.4	16.7	17.8
4			
	15.4	16.7	17.8
8			
	15.4	16.7	17.8
12			
	15.4	16.7	17.8
16			
	15.4	16.7	17.8
20			
	15.4	16.6	17.7
24			
	15.4	16.6	17.7
28			
	15.4	16.6	17.6
32			
	15.4	16.5	17.5
36			
	15.4	16.5	17.5
40			
	15.4	16.5	17.4
44			
	15.5	16.4	17.3
48			
	15.5	16.4	17.2
52			
	15.5	16.3	17.1
56			
	15.5	16.3	17.0
60			
	15.5	16.2	16.9
64			
	15.5	16.2	16.8
68			
	15.5	16.1	16.7
72			
	15.5	16.0	16.5
76			
	15.5	16.0	16.4
80			
	15.5	15.9	16.3
84			
	15.5	15.9	16.2
88			
	15.5	15.8	16.1
90			

Add to table, back cover

Moon's Upper Limb
Subtract

Alt.	24	25	26
°	′	′	′
0			
	15.6	14.9	14.2
4			
	15.6	14.9	14.3
8			
	15.6	14.9	14.3
12			
	15.6	14.9	14.3
16			
	15.6	14.9	14.3
20			
	15.6	15.0	14.4
24			
	15.6	15.0	14.4
28			
	15.6	15.0	14.5
32			
	15.6	15.0	14.5
36			
	15.6	15.1	14.6
40			
	15.6	15.1	14.7
44			
	15.6	15.2	14.8
48			
	15.6	15.2	14.9
52			
	15.6	15.3	15.0
56			
	15.6	15.3	15.1
60			
	15.6	15.4	15.2
64			
	15.6	15.4	15.3
68			
	15.6	15.5	15.4
72			
	15.6	15.5	15.5
76			
	15.5	15.6	15.7
80			
	15.5	15.7	15.8
84			
	15.5	15.7	15.9
88			
	15.5	15.8	16.0
90			

Subtract from table, back cover

GCT	Equation of Time (App.—Mean) 24	25	26
h	m s	m s	m s
0	+13 36.0	+13 18.9	+13 01.0
6	+13 31.8	+13 14.5	+12 56.4
12	+13 27.5	+13 10.0	+12 51.7
18	+13 23.2	+13 05.5	+12 47.1
24	+13 18.9	+13 01.0	+12 42.3

GCT of Transit Meridian of Greenwich

DAY	Moon	Venus	Mars	Jupiter	Saturn
	h m	h m	h m	h m	h m
24	7 46	8 48	7 53	20 06	8 37
25	8 31	8 48	7 51	20 02	8 34
26	9 18	8 48	7 49	19 58	8 30
27	10 11	8 48	7 47	19 54	8 26

GCT	♈ GHA	VENUS −3.9 GHA	Dec.	MARS 1.6 GHA	Dec.	JUPITER −2.2 GHA	Dec.	SATURN 1.1 GHA	Dec.	MOON GHA	code	Dec.	code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
0	65 06.1	227 56.1	− 5 09.3	243 01.2	+ 0 51.4	60 36.2	+ 0 20.6	233 06.2	− 2 42.0	212 46.5	89	−17 41.7	−133
1	80 08.6	242 56.0	10.2	258 02.3	50.8	75 38.7	20.6	248 08.4	42.1	227 14.4	88	17 55.0	−133
2	95 11.0	257 55.9	11.1	273 03.5	50.3	90 41.2	20.6	263 10.7	42.2	241 42.2	86	18 08.3	−131
3	110 13.5	272 55.8	·· 12.0	288 04.6	·· 49.7	105 43.7	·· 20.6	278 12.9	·· 42.3	256 09.8	86	·18 21.4	−131
4	125 16.0	287 55.7	12.9	303 05.8	49.2	120 46.2	20.6	293 15.2	42.4	270 37.4	83	18 34.5	−130
5	140 18.4	302 55.6	13.9	318 06.9	48.6	135 48.7	20.6	308 17.4	42.4	285 04.7	83	18 47.5	−129
6	155 20.9	317 55.5	− 5 14.8	333 08.1	+ 0 48.1	150 51.2	+ 0 20.6	323 19.7	− 2 42.5	299 32.0	81	−19 00.4	−128
7	170 23.4	332 55.4	15.7	348 09.2	47.5	165 53.7	20.6	338 21.9	42.6	313 59.1	80	19 13.2	−127
8	185 25.8	347 55.3	16.6	3 10.4	46.9	180 56.2	20.6	353 24.2	42.7	328 26.1	79	19 25.9	−126
9	200 28.3	2 55.2	·· 17.5	18 11.5	·· 46.4	195 58.7	·· 20.6	8 26.4	·· 42.8	342 53.0	77	·19 38.5	−125
10	215 30.8	17 55.1	18.5	33 12.7	45.8	211 01.2	20.6	23 28.7	42.9	357 19.7	76	19 51.0	−123
11	230 33.2	32 55.0	19.4	48 13.8	45.3	226 03.6	20.6	38 30.9	42.9	11 46.3	74	20 03.3	−123
12	245 35.7	47 54.9	− 5 20.3	63 15.0	+ 0 44.7	241 06.1	+ 0 20.6	53 33.2	− 2 43.0	26 12.7	74	−20 15.6	−122
13	260 38.1	62 54.8	21.2	78 16.1	44.2	256 08.6	20.6	68 35.4	43.1	40 39.1	71	20 27.8	−120
14	275 40.6	77 54.7	22.1	93 17.3	43.6	271 11.1	20.6	83 37.7	43.2	55 05.2	71	20 39.8	−120
15	290 43.1	92 54.6	·· 23.1	108 18.4	·· 43.1	286 13.6	·· 20.6	98 39.9	·· 43.3	69 31.3	69	·20 51.8	−118
16	305 45.5	107 54.5	24.0	123 19.6	42.5	301 16.1	20.6	113 42.2	43.3	83 57.2	68	21 03.6	−117
17	320 48.0	122 54.4	24.9	138 20.7	42.0	316 18.6	20.6	128 44.4	43.4	98 23.0	66	21 15.3	−116
18	335 50.5	137 54.3	− 5 25.8	153 21.9	+ 0 41.4	331 21.1	+ 0 20.6	143 46.7	− 2 43.5	112 48.6	65	−21 26.9	−115
19	350 52.9	152 54.1	26.7	168 23.0	40.8	346 23.6	20.6	158 48.9	43.6	127 14.1	64	21 38.4	−113
20	5 55.4	167 54.0	27.7	183 24.2	40.3	1 26.0	20.6	173 51.2	43.7	141 39.5	62	21 49.7	−112
21	20 57.9	182 53.9	·· 28.6	198 25.3	·· 39.7	16 28.5	·· 20.6	188 53.4	·· 43.7	156 04.7	61	·22 00.9	−111
22	36 00.3	197 53.8	29.5	213 26.5	39.2	31 31.0	20.6	203 55.7	43.8	170 29.8	59	22 12.0	−110
23	51 02.8	212 53.7	30.4	228 27.6	38.6	46 33.5	20.6	218 58.0	43.9	184 54.7	59	22 23.0	−108
0	66 05.3	227 53.6	− 5 31.3	243 28.8	+ 0 38.1	61 36.0	+ 0 20.6	234 00.2	− 2 44.0	199 19.6	57	−22 33.8	−106
1	81 07.7	242 53.5	32.3	258 29.9	37.5	76 38.5	20.6	249 02.5	44.1	213 44.3	55	22 44.4	−106
2	96 10.2	257 53.4	33.2	273 31.1	37.0	91 41.0	20.6	264 04.7	44.1	228 08.8	54	22 55.0	−104
3	111 12.6	272 53.3	·· 34.1	288 32.2	·· 36.4	106 43.5	·· 20.6	279 07.0	·· 44.2	242 33.2	53	·23 05.4	−102
4	126 15.1	287 53.1	35.0	303 33.4	35.9	121 45.9	20.6	294 09.2	44.3	256 57.5	52	23 15.6	−101
5	141 17.6	302 53.0	35.9	318 34.5	35.3	136 48.4	20.6	309 11.5	44.4	271 21.7	50	23 25.7	−100
6	156 20.0	317 52.9	− 5 36.9	333 35.7	+ 0 34.8	151 50.9	+ 0 20.6	324 13.7	− 2 44.5	285 45.7	49	−23 35.7	− 98
7	171 22.5	332 52.8	37.8	348 36.8	34.2	166 53.4	20.6	339 16.0	44.5	300 09.6	47	23 45.5	− 97
8	186 25.0	347 52.7	38.7	3 38.0	33.6	181 55.9	20.6	354 18.2	44.6	314 33.3	47	23 55.2	− 95
9	201 27.4	2 52.6	·· 39.6	18 39.1	·· 33.1	196 58.4	·· 20.6	9 20.5	·· 44.7	328 57.0	45	·24 04.7	− 93
10	216 29.9	17 52.5	40.6	33 40.3	32.5	212 00.8	20.6	24 22.7	44.8	343 20.5	44	24 14.0	− 92
11	231 32.4	32 52.3	41.5	48 41.5	32.0	227 03.3	20.6	39 25.0	44.9	357 43.9	42	24 23.2	− 90
12	246 34.8	47 52.2	− 5 42.4	63 42.6	+ 0 31.4	242 05.8	+ 0 20.6	54 27.3	− 2 44.9	12 07.1	41	−24 32.2	− 89
13	261 37.3	62 52.1	43.3	78 43.8	30.9	257 08.3	20.7	69 29.5	45.0	26 30.2	41	24 41.1	− 87
14	276 39.8	77 52.0	44.3	93 44.9	30.3	272 10.8	20.7	84 31.8	45.1	40 53.3	38	24 49.8	− 86
15	291 42.2	92 51.9	·· 45.2	108 46.1	·· 29.8	287 13.3	·· 20.7	99 34.0	·· 45.2	55 16.1	38	·24 58.4	− 83
16	306 44.7	107 51.7	46.1	123 47.2	29.2	302 15.7	20.7	114 36.3	45.3	69 38.9	36	25 06.7	− 82
17	321 47.1	122 51.6	47.0	138 48.4	28.7	317 18.2	20.7	129 38.5	45.3	84 01.5	36	25 14.9	− 80
18	336 49.6	137 51.5	− 5 47.9	153 49.5	+ 0 28.1	332 20.7	+ 0 20.7	144 40.8	− 2 45.4	98 24.1	34	−25 22.9	− 79
19	351 52.1	152 51.4	48.9	168 50.7	27.6	347 23.2	20.7	159 43.0	45.5	112 46.5	33	25 30.8	− 76
20	6 54.5	167 51.3	49.8	183 51.8	27.0	2 25.7	20.7	174 45.3	45.6	127 08.8	31	25 38.4	− 75
21	21 57.0	182 51.1	·· 50.7	198 53.0	·· 26.5	17 28.1	·· 20.7	189 47.5	·· 45.6	141 30.9	31	·25 45.9	− 73
22	36 59.5	197 51.0	51.6	213 54.2	25.9	32 30.6	20.7	204 49.8	45.7	155 53.0	30	25 53.2	− 72
23	52 01.9	212 50.9	52.6	228 55.3	25.4	47 33.1	20.7	219 52.1	45.8	170 15.0	28	26 00.4	− 69
0	67 04.4	227 50.8	− 5 53.5	243 56.5	+ 0 24.8	62 35.6	+ 0 20.7	234 54.3	− 2 45.9	184 36.8	28	−26 07.3	− 68
1	82 06.9	242 50.6	54.4	258 57.6	24.2	77 38.1	20.7	249 56.6	46.0	198 58.6	27	26 14.1	− 65
2	97 09.3	257 50.5	55.3	273 58.8	23.7	92 40.5	20.7	264 58.8	46.0	213 20.3	25	26 20.6	− 64
3	112 11.8	272 50.4	·· 56.3	288 59.9	·· 23.1	107 43.0	·· 20.7	280 01.1	·· 46.1	227 41.8	25	·26 27.0	− 62
4	127 14.3	287 50.3	57.2	304 01.1	22.6	122 45.5	20.7	295 03.3	46.2	242 03.3	23	26 33.2	− 60
5	142 16.7	302 50.1	58.1	319 02.2	22.0	137 48.0	20.8	310 05.6	46.3	256 24.6	23	26 39.2	− 58
6	157 19.2	317 50.0	− 5 59.1	334 03.4	+ 0 21.5	152 50.4	+ 0 20.8	325 07.8	− 2 46.4	270 45.9	22	−26 45.0	− 56
7	172 21.6	332 49.9	6 00.0	349 04.5	20.9	167 52.9	20.8	340 10.1	46.4	285 07.1	21	26 50.6	− 54
8	187 24.1	347 49.8	00.9	4 05.7	20.4	182 55.4	20.8	355 12.4	46.5	299 28.2	20	26 56.0	− 52
9	202 26.6	2 49.6	·· 01.8	19 06.9	·· 19.8	197 57.9	·· 20.8	10 14.6	·· 46.6	313 49.2	19	·27 01.2	− 50
10	217 29.0	17 49.5	02.8	34 08.0	19.3	213 00.3	20.8	25 16.9	46.7	328 10.1	19	27 06.2	− 48
11	232 31.5	32 49.4	03.7	49 09.2	18.7	228 02.8	20.8	40 19.1	46.7	342 31.0	18	27 11.0	− 46
12	247 34.0	47 49.2	− 6 04.6	64 10.3	+ 0 18.2	243 05.3	+ 0 20.8	55 21.4	− 2 46.8	356 51.8	17	−27 15.6	− 44
13	262 36.4	62 49.1	05.5	79 11.5	17.6	258 07.8	20.8	70 23.6	46.9	11 12.5	16	27 20.0	− 42
14	277 38.9	77 49.0	06.5	94 12.6	17.1	273 10.2	20.8	85 25.9	47.0	25 33.1	16	27 24.2	− 39
15	292 41.4	92 48.9	·· 07.4	109 13.8	·· 16.5	288 12.7	·· 20.8	100 28.2	·· 47.1	39 53.7	15	·27 28.1	− 38
16	307 43.8	107 48.7	08.3	124 15.0	16.0	303 15.2	20.9	115 30.4	47.1	54 14.2	14	27 31.9	− 36
17	322 46.3	122 48.6	09.2	139 16.1	15.4	318 17.7	20.9	130 32.7	47.2	68 34.6	14	27 35.5	− 33
18	337 48.8	137 48.5	− 6 10.2	154 17.3	+ 0 14.9	333 20.1	+ 0 20.9	145 34.9	− 2 47.3	82 55.0	13	−27 38.8	− 32
19	352 51.2	152 48.3	11.1	169 18.4	14.3	348 22.6	20.9	160 37.2	47.4	97 15.3	13	27 42.0	− 29
20	7 53.7	167 48.2	12.0	184 19.6	13.8	3 25.1	20.9	175 39.4	47.4	111 35.6	13	27 44.9	− 27
21	22 56.1	182 48.1	·· 13.0	199 20.7	·· 13.2	18 27.6	·· 20.9	190 41.7	·· 47.5	125 55.9	11	·27 47.6	− 25
22	37 58.6	197 47.9	13.9	214 21.9	12.7	33 30.0	20.9	205 44.0	47.6	140 16.0	12	27 50.1	− 23
23	53 01.1	212 47.8	14.8	229 23.1	12.1	48 32.5	20.9	220 46.2	47.7	154 36.2	11	27 52.4	− 20
24	68 03.5	227 47.7	− 6 15.7	244 24.2	+ 0 11.6	63 35.0	+ 0 20.9	235 48.5	− 2 47.8	168 56.3	11	−27 54.4	− 19
code	—	− 1	− 9	+ 12	− 5	+ 25	+ 1	+ 22	− 1				

GCT (h)	SUN GHA (° ′)	SUN Dec. (° ′)
27		
0	183 10.5	−20 56.5
1	198 10.3	57.0
2	213 10.1	57.4
3	228 09.9	•• 57.9
4	243 09.7	58.4
5	258 09.5	58.9
6	273 09.3	−20 59.3
7	288 09.1	20 59.8
8	303 08.9	21 00.3
9	318 08.7	•• 00.7
10	333 08.5	01.2
11	348 08.3	01.7
12	3 08.1	−21 02.1
13	18 07.9	02.6
14	33 07.7	03.1
15	48 07.5	•• 03.5
16	63 07.3	04.0
17	78 07.1	04.5
18	93 06.9	−21 04.9
19	108 06.7	05.4
20	123 06.4	05.8
21	138 06.2	•• 06.3
22	153 06.0	06.8
23	168 05.8	07.2
28		
0	183 05.6	−21 07.7
1	198 05.4	08.1
2	213 05.2	08.6
3	228 05.0	•• 09.0
4	243 04.8	09.5
5	258 04.6	10.0
6	273 04.4	−21 10.4
7	288 04.2	10.9
8	303 04.0	11.3
9	318 03.8	•• 11.8
10	333 03.6	12.2
11	348 03.3	12.7
12	3 03.1	−21 13.1
13	18 02.9	13.6
14	33 02.7	14.0
15	48 02.5	•• 14.5
16	63 02.3	14.9
17	78 02.1	15.4
18	93 01.9	−21 15.8
19	108 01.7	16.2
20	123 01.4	16.7
21	138 01.2	•• 17.1
22	153 01.0	17.6
23	168 00.8	18.0
29		
0	183 00.6	−21 18.5
1	198 00.4	18.9
2	213 00.2	19.3
3	227 59.9	•• 19.8
4	242 59.7	20.2
5	257 59.5	20.7
6	272 59.3	−21 21.1
7	287 59.1	21.5
8	302 58.9	22.0
9	317 58.7	•• 22.4
10	332 58.4	22.8
11	347 58.2	23.3
12	2 58.0	−21 23.7
13	17 57.8	24.1
14	32 57.6	24.6
15	47 57.3	•• 25.0
16	62 57.1	25.4
17	77 56.9	25.9
18	92 56.7	−21 26.3
19	107 56.5	26.7
20	122 56.3	27.1
21	137 56.0	•• 27.6
22	152 55.8	28.0
23	167 55.6	28.4
24	182 55.4	−21 28.8
code	—	− 5

STARS No.	SHA (° ′)	Dec. (° ′)	Transit Mer. Gr. (h m)
1	358 31.4	+28 49.7	19 38
2	358 20.9	+58 53.4	19 39
3	349 42.0	−18 15.0	20 14
4	339 19.9	+59 59.5	20 55
5	336 00.4	−57 28.9	21 08
6	332 19.3	+89 02.6	21 23
7	328 52.8	+23 14.4	21 37
8	315 52.9	−40 29.7	22 28
9	309 46.3	+49 41.7	22 53
10	291 42.2	+16 25.0	0 09
11	281 56.2	− 8 15.1	0 48
12	281 42.4	+45 57.2	0 49
13	279 21.3	+ 6 18.6	0 58
14	279 10.8	+28 34.3	0 59
15	276 33.0	− 1 13.7	1 09
16	271 51.1	+ 7 24.2	1 28
17	264 16.2	−52 39.8	1 58
18	259 14.2	−16 38.7	2 18
19	255 48.6	−28 54.1	2 32
20	245 47.9	+ 5 21.1	3 12
21	244 24.0	+28 08.7	3 18
22	234 36.8	−59 20.9	3 57
23	223 26.5	−43 13.9	4 41
24	221 49.7	−69 30.8	4 48
25	218 41.5	− 8 26.8	5 00
26	208 32.7	+12 12.2	5 41
27	194 48.1	+62 00.4	6 35
28	183 20.9	+14 50.4	7 21
29	174 01.8	−62 49.7	7 58
30	172 53.1	−56 50.4	8 03
31	168 47.1	−59 25.4	8 19
32	167 01.3	+56 13.0	8 26
33	159 30.3	+55 10.3	8 56
34	159 20.3	−10 54.6	8 57
35	153 35.5	+49 32.9	9 20
36	149 02.7	−36 08.0	9 38
37	146 38.2	+19 25.8	9 47
38	140 55.9	−60 38.3	10 10
39	137 18.5	+74 20.9	10 25
40	126 50.5	+26 52.4	11 06
41	120 38.0	−22 29.2	11 31
42	113 23.5	−26 19.7	12 00
43	109 07.6	−68 56.7	12 17
44	103 06.0	−15 40.1	12 41
45	97 25.2	−37 04.4	13 04
46	96 49.7	+12 35.6	13 06
47	91 08.1	+51 29.6	13 29
48	84 45.5	−34 24.7	13 54
49	81 10.7	+38 44.3	14 09
50	76 55.9	−26 21.7	14 26
51	62 53.6	+ 8 44.4	15 22
52	54 32.2	−56 53.8	15 55
53	50 03.4	+45 06.6	16 13
54	34 32.7	+ 9 39.3	17 15
55	28 41.6	−47 11.9	17 38
56	16 14.8	−29 52.8	18 28
57	14 24.4	+14 56.9	18 35

Lat. (°)	Sunrise (h m)	Twlt. begins (h m)	Moonrise 27 (h m)	Moonrise 28 (h m)	Moonrise 29 (h m)	Moonrise 30 (h m)
N 70	■	6 08	■	■	■	■
68	10 15	6 03	8 15	■	■	■
66	9 34	5 59	7 36	■	■	■
64	9 06	5 55	7 10	9 38	■	■
62	8 44	5 52	6 49	8 55	11 17	■
60	8 27	5 48	6 32	8 27	10 22	11 49
58	8 13	5 45	6 18	8 05	9 49	11 11
56	8 01	5 43	6 06	7 47	9 25	10 44
54	7 50	5 40	5 56	7 32	9 05	10 23
52	7 40	5 37	5 47	7 19	8 49	10 05
50	7 32	5 34	5 39	7 08	8 35	9 50
45	7 14	5 28	5 21	6 44	8 06	9 19
40	6 59	5 22	5 07	6 25	7 43	8 55
35	6 46	5 16	4 55	6 10	7 25	8 36
30	6 35	5 10	4 45	5 56	7 09	8 19
20	6 16	4 59	4 28	5 33	6 42	7 51
10	6 00	4 45	4 12	5 13	6 19	7 26
0	5 44	4 30	3 58	4 55	5 58	7 04
10	5 28	4 12	3 44	4 37	5 36	6 41
20	5 11	3 49	3 29	4 18	5 14	6 17
30	4 52	3 19	3 12	3 55	4 47	5 49
35	4 40	2 58	3 03	3 43	4 32	5 32
40	4 27	2 31	2 51	3 28	4 14	5 13
45	4 11	1 53	2 38	3 10	3 53	4 50
50	3 51	0 38	2 23	2 49	3 26	4 20
52	3 42	////	2 15	2 39	3 13	4 05
54	3 32	////	2 07	2 27	2 58	3 48
56	3 20	////	1 58	2 14	2 41	3 28
58	3 06	////	1 48	1 59	2 20	3 02
60	2 49	////	1 36	1 41	1 53	2 27
S						

Lat. (°)	Sunset (h m)	Twlt. ends (h m)	Moonset 27 (h m)	Moonset 28 (h m)	Moonset 29 (h m)	Moonset 30 (h m)
N 70	■	17 25	■	■	■	■
68	13 20	17 30	11 48	■	■	■
66	14 01	17 34	12 28	■	■	■
64	14 29	17 38	12 56	12 28	■	■
62	14 51	17 42	13 17	13 12	13 03	■
60	15 08	17 45	13 35	13 41	13 59	14 52
58	15 22	17 48	13 50	14 03	14 32	15 30
56	15 35	17 52	14 02	14 22	14 56	15 57
54	15 46	17 55	14 13	14 37	15 16	16 18
52	15 55	17 57	14 23	14 51	15 33	16 36
50	16 04	18 00	14 32	15 03	15 47	16 51
45	16 22	18 06	14 51	15 27	16 17	17 21
40	16 37	18 13	15 07	15 47	16 40	17 45
35	16 49	18 18	15 20	16 04	16 59	18 04
30	17 00	18 24	15 31	16 18	17 15	18 21
20	17 19	18 37	15 51	16 43	17 43	18 49
10	17 36	18 50	16 08	17 04	18 07	19 13
0	17 51	19 05	16 24	17 24	18 29	19 36
10	18 07	19 23	16 41	17 44	18 51	19 58
20	18 24	19 46	16 58	18 06	19 15	20 22
30	18 44	20 18	17 18	18 31	19 43	20 50
35	18 56	20 39	17 30	18 45	19 59	21 06
40	19 09	21 06	17 44	19 02	20 18	21 25
45	19 25	21 45	18 00	19 23	20 41	21 48
50	19 45	23 03	18 20	19 49	21 11	22 17
52	19 54	////	18 30	20 02	21 26	22 32
54	20 05	////	18 41	20 16	21 43	22 48
56	20 17	////	18 53	20 33	22 03	23 08
58	20 31	////	19 08	20 54	22 29	23 33
60	20 47	////	19 25	21 20	23 04	24 05
S						

Equation of Time (App.—Mean)

GCT (h)	27 (m s)	28 (m s)	29 (m s)
0	+12 42.3	+12 22.9	+12 02.8
6	+12 37.5	+12 18.0	+11 57.6
12	+12 32.7	+12 12.9	+11 52.5
18	+12 27.8	+12 07.9	+11 47.2
24	+12 22.9	+12 02.8	+11 42.0

GCT of Transit Meridian of Greenwich

DAY	Moon (h m)	Venus (h m)	Mars (h m)	Jupiter (h m)	Saturn (h m)
27	10 11	8 48	7 47	19 54	8 26
28	11 10	8 49	7 46	19 50	8 23
29	12 13	8 49	7 44	19 46	8 19
30	13 20	8 49	7 42	19 42	8 16

ADDITIONAL ALTITUDE CORRECTIONS

Alt. (°)	Sun's Low'r Limb (′)	Venus (′)	Mars (′)
0			
	0.5	0.2	0.1
30			
	0.5	0.1	0.1
45			
	0.5	0.1	0.0
60			
	0.5	0.1	0.0
75			
	0.5	0.0	0.0
90			

Moon's Lower Limb

Add

Alt. (°)	27 (′)	28 (′)	29 (′)
0			
	18.9	19.7	20.3
4			
	18.8	19.7	20.2
8			
	18.8	19.7	20.2
12			
	18.8	19.7	20.1
16			
	18.7	19.6	20.1
20			
	18.7	19.5	20.0
24			
	18.6	19.4	19.9
28			
	18.5	19.3	19.8
32			
	18.4	19.2	19.6
36			
	18.3	19.1	19.5
40			
	18.2	18.9	19.3
44			
	18.1	18.7	19.1
48			
	17.9	18.6	18.9
52			
	17.8	18.4	18.7
56			
	17.6	18.2	18.5
60			
	17.5	18.0	18.3
64			
	17.3	17.8	18.1
68			
	17.1	17.6	17.8
72			
	17.0	17.4	17.6
76			
	16.8	17.1	17.3
80			
	16.6	16.9	17.1
84			
	16.4	16.7	16.8
88			
	16.3	16.5	16.6
90			

Add to table, back cover

Moon's Upper Limb

Subtract

Alt. (°)	27 (′)	28 (′)	29 (′)
0			
	13.7	13.2	12.9
4			
	13.7	13.2	12.9
8			
	13.7	13.2	12.9
12			
	13.7	13.2	13.0
16			
	13.8	13.3	13.0
20			
	13.8	13.4	13.1
24			
	13.9	13.5	13.2
28			
	14.0	13.6	13.4
32			
	14.1	13.7	13.5
36			
	14.2	13.8	13.6
40			
	14.3	14.0	13.8
44			
	14.5	14.2	14.0
48			
	14.6	14.3	14.2
52			
	14.7	14.5	14.4
56			
	14.9	14.7	14.6
60			
	15.0	14.9	14.8
64			
	15.2	15.1	15.1
68			
	15.4	15.3	15.3
72			
	15.5	15.5	15.5
76			
	15.7	15.8	15.8
80			
	15.9	16.0	16.0
84			
	16.1	16.2	16.3
88			
	16.2	16.4	16.5
90			

Subtract from table, back cover

New Moon 29

833190°—50——15

GCT	♈	VENUS −3.9		MARS 1.6		JUPITER −2.2		SATURN 1.1		MOON			
	GHA	GHA	Dec.	GHA	Dec.	GHA	Dec.	GHA	Dec.	GHA	code	Dec.	code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
0	68 03.5	227 47.7	− 6 15.7	244 24.2	+ 0 11.6	63 35.0	+ 0 20.9	235 48.5	− 2 47.8	168 56.3	11	−27 54.4	− 19
1	83 06.0	242 47.5	16.7	259 25.4	11.0	78 37.4	20.9	250 50.7	47.8	183 16.4	11	27 56.3	− 16
2	98 08.5	257 47.4	17.6	274 26.5	10.5	93 39.9	21.0	265 53.0	47.9	197 36.5	10	27 57.9	− 14
3	113 10.9	272 47.2	18.5	289 27.7	09.9	108 42.4	21.0	280 55.2	48.0	211 56.5	10	27 59.3	− 12
4	128 13.4	287 47.1	19.4	304 28.8	09.3	123 44.8	21.0	295 57.5	48.1	226 16.5	10	28 00.5	− 10
5	143 15.9	302 47.0	20.4	319 30.0	08.8	138 47.3	21.0	310 59.8	48.1	240 36.5	10	28 01.5	− 8
6	158 18.3	317 46.8	− 6 21.3	334 31.2	+ 0 08.2	153 49.8	+ 0 21.0	326 02.0	− 2 48.2	254 56.5	9	−28 02.3	− 5
7	173 20.8	332 46.7	22.2	349 32.3	07.7	168 52.3	21.0	341 04.3	48.3	269 16.4	10	28 02.8	− 4
8	188 23.2	347 46.5	23.2	4 33.5	07.1	183 54.7	21.0	356 06.5	48.4	283 36.4	9	28 03.2	− 1
9	203 25.7	2 46.4	24.1	19 34.6	06.6	198 57.2	21.0	11 08.8	48.5	297 56.3	10	28 03.3	+ 1
10	218 28.2	17 46.3	25.0	34 35.8	06.0	213 59.7	21.0	26 11.1	48.5	312 16.3	9	28 03.2	+ 4
11	233 30.6	32 46.1	25.9	49 37.0	05.5	229 02.1	21.1	41 13.3	48.6	326 36.2	10	28 02.8	+ 5
12	248 33.1	47 46.0	− 6 26.9	64 38.1	+ 0 04.9	244 04.6	+ 0 21.1	56 15.6	− 2 48.7	340 56.2	10	−28 02.3	+ 8
13	263 35.6	62 45.8	27.8	79 39.3	04.4	259 07.1	21.1	71 17.8	48.8	355 16.2	9	28 01.5	+ 10
14	278 38.0	77 45.7	28.7	94 40.4	03.8	274 09.5	21.1	86 20.1	48.8	9 36.1	10	28 00.5	+ 12
15	293 40.5	92 45.6	29.7	109 41.6	03.3	289 12.0	21.1	101 22.4	48.9	23 56.1	11	27 59.3	+ 14
16	308 43.0	107 45.4	30.6	124 42.8	02.7	304 14.5	21.1	116 24.6	49.0	38 16.2	10	27 57.9	+ 16
17	323 45.4	122 45.3	31.5	139 43.9	02.2	319 16.9	21.1	131 26.9	49.1	52 36.2	11	27 56.3	+ 19
18	338 47.9	137 45.1	− 6 32.5	154 45.1	+ 0 01.6	334 19.4	+ 0 21.1	146 29.1	− 2 49.1	66 56.3	11	−27 54.4	+ 20
19	353 50.4	152 45.0	33.4	169 46.2	01.1	349 21.8	21.2	161 31.4	49.2	81 16.4	11	27 52.4	+ 23
20	8 52.8	167 44.8	34.3	184 47.4	+ 0 00.5	4 24.3	21.2	176 33.7	49.3	95 36.5	12	27 50.1	+ 25
21	23 55.3	182 44.7	35.2	199 48.6	0 00.0	19 26.8	21.2	191 35.9	49.4	109 56.7	12	27 47.6	+ 27
22	38 57.7	197 44.5	36.2	214 49.7	− 0 00.6	34 29.2	21.2	206 38.2	49.5	124 16.9	13	27 44.9	+ 30
23	54 00.2	212 44.4	37.1	229 50.9	01.1	49 31.7	21.2	221 40.4	49.5	138 37.2	13	27 41.9	+ 31
0	69 02.7	227 44.2	− 6 38.0	244 52.0	− 0 01.7	64 34.2	+ 0 21.2	236 42.7	− 2 49.6	152 57.5	14	−27 38.8	+ 34
1	84 05.1	242 44.1	39.0	259 53.2	02.2	79 36.6	21.2	251 45.0	49.7	167 17.9	14	27 35.4	+ 35
2	99 07.6	257 43.9	39.9	274 54.4	02.8	94 39.1	21.3	266 47.2	49.8	181 38.3	15	27 31.9	+ 38
3	114 10.1	272 43.8	40.8	289 55.5	03.3	109 41.5	21.3	281 49.5	49.8	195 58.8	16	27 28.1	+ 40
4	129 12.5	287 43.6	41.8	304 56.7	03.9	124 44.0	21.3	296 51.7	49.9	210 19.4	16	27 24.1	+ 42
5	144 15.0	302 43.5	42.7	319 57.8	04.4	139 46.5	21.3	311 54.0	50.0	224 40.0	16	27 19.9	+ 44
6	159 17.5	317 43.3	− 6 43.6	334 59.0	− 0 04.9	154 48.9	+ 0 21.3	326 56.3	− 2 50.1	239 00.6	18	−27 15.5	+ 46
7	174 19.9	332 43.2	44.5	350 00.2	05.5	169 51.4	21.3	341 58.5	50.1	253 21.4	18	27 10.9	+ 48
8	189 22.4	347 43.0	45.5	5 01.3	06.0	184 53.9	21.3	357 00.8	50.2	267 42.2	19	27 06.1	+ 50
9	204 24.9	2 42.9	46.4	20 02.5	06.6	199 56.3	21.4	12 03.1	50.3	282 03.1	20	27 01.1	+ 52
10	219 27.3	17 42.7	47.3	35 03.7	07.1	214 58.8	21.4	27 05.3	50.4	296 24.1	20	26 55.9	+ 54
11	234 29.8	32 42.6	48.3	50 04.8	07.7	230 01.2	21.4	42 07.6	50.4	310 45.1	22	26 50.5	+ 56
12	249 32.2	47 42.4	− 6 49.2	65 06.0	− 0 08.2	245 03.7	+ 0 21.4	57 09.8	− 2 50.5	325 06.3	22	−26 44.9	+ 58
13	264 34.7	62 42.3	50.1	80 07.1	08.8	260 06.1	21.4	72 12.1	50.6	339 27.5	23	26 39.1	+ 60
14	279 37.2	77 42.1	51.1	95 08.3	09.3	275 08.6	21.4	87 14.4	50.7	353 48.8	25	26 33.1	+ 62
15	294 39.6	92 42.0	52.0	110 09.5	09.9	290 11.1	21.5	102 16.6	50.7	8 10.3	25	26 26.9	+ 64
16	309 42.1	107 41.8	52.9	125 10.6	10.4	305 13.5	21.5	117 18.9	50.8	22 31.8	26	26 20.5	+ 66
17	324 44.6	122 41.7	53.9	140 11.8	11.0	320 16.0	21.5	132 21.2	50.9	36 53.4	27	26 13.9	+ 67
18	339 47.0	137 41.5	− 6 54.8	155 13.0	− 0 11.5	335 18.4	+ 0 21.5	147 23.4	− 2 51.0	51 15.1	28	−26 07.2	+ 70
19	354 49.5	152 41.3	55.7	170 14.1	12.1	350 20.9	21.5	162 25.7	51.0	65 36.9	29	26 00.2	+ 71
20	9 52.0	167 41.2	56.7	185 15.3	12.6	5 23.3	21.5	177 27.9	51.1	79 58.8	30	25 53.1	+ 73
21	24 54.4	182 41.0	57.6	200 16.4	13.2	20 25.8	21.6	192 30.2	51.2	94 20.8	31	25 45.8	+ 75
22	39 56.9	197 40.9	58.5	215 17.6	13.7	35 28.3	21.6	207 32.5	51.3	108 42.9	32	25 38.3	+ 77
23	54 59.4	212 40.7	6 59.5	230 18.8	14.3	50 30.7	21.6	222 34.7	51.3	123 05.1	34	25 30.6	+ 79
0	70 01.8	227 40.5	− 7 00.4	245 19.9	− 0 14.8	65 33.2	+ 0 21.6	237 37.0	− 2 51.4	137 27.5	34	−25 22.7	+ 80
1	85 04.3	242 40.4	01.3	260 21.1	15.4	80 35.6	21.6	252 39.3	51.5	151 49.9	36	25 14.7	+ 83
2	100 06.7	257 40.2	02.3	275 22.3	15.9	95 38.1	21.6	267 41.5	51.6	166 12.5	37	25 06.4	+ 83
3	115 09.2	272 40.1	03.2	290 23.4	16.5	110 40.5	21.7	282 43.8	51.6	180 35.2	38	24 58.1	+ 86
4	130 11.7	287 39.9	04.1	305 24.6	17.0	125 43.0	21.7	297 46.0	51.7	194 58.0	39	24 49.5	+ 87
5	145 14.1	302 39.7	05.0	320 25.8	17.6	140 45.4	21.7	312 48.3	51.8	209 20.9	40	24 40.8	+ 89
6	160 16.6	317 39.6	− 7 06.0	335 26.9	− 0 18.1	155 47.9	+ 0 21.7	327 50.6	− 2 51.9	223 43.9	42	−24 31.9	+ 91
7	175 19.1	332 39.4	06.9	350 28.1	18.7	170 50.3	21.7	342 52.8	51.9	238 07.1	42	24 22.8	+ 92
8	190 21.5	347 39.2	07.8	5 29.2	19.2	185 52.8	21.7	357 55.1	52.0	252 30.3	44	24 13.6	+ 94
9	205 24.0	2 39.1	08.8	20 30.4	19.7	200 55.2	21.8	12 57.4	52.1	266 53.7	46	24 04.2	+ 95
10	220 26.5	17 38.9	09.7	35 31.6	20.3	215 57.7	21.8	27 59.6	52.2	281 17.3	46	23 54.7	+ 97
11	235 28.9	32 38.8	10.6	50 32.7	20.8	231 00.1	21.8	43 01.9	52.2	295 40.9	48	23 45.0	+ 99
12	250 31.4	47 38.6	− 7 11.6	65 33.9	− 0 21.4	246 02.6	+ 0 21.8	58 04.2	− 2 52.3	310 04.7	49	−23 35.1	+100
13	265 33.8	62 38.4	12.5	80 35.1	21.9	261 05.0	21.8	73 06.4	52.4	324 28.6	50	23 25.1	+101
14	280 36.3	77 38.3	13.4	95 36.2	22.5	276 07.5	21.9	88 08.7	52.5	338 52.6	52	23 15.0	+103
15	295 38.8	92 38.1	14.4	110 37.4	23.0	291 09.9	21.9	103 11.0	52.5	353 16.8	53	23 04.7	+105
16	310 41.2	107 37.9	15.3	125 38.6	23.6	306 12.4	21.9	118 13.2	52.6	7 41.1	54	22 54.2	+105
17	325 43.7	122 37.8	16.2	140 39.7	24.1	321 14.8	21.9	133 15.5	52.7	22 05.5	55	22 43.7	+108
18	340 46.2	137 37.6	− 7 17.2	155 40.9	− 0 24.7	336 17.3	+ 0 21.9	148 17.8	− 2 52.8	36 30.0	57	−22 32.9	+108
19	355 48.6	152 37.4	18.1	170 42.1	25.2	351 19.7	22.0	163 20.0	52.8	50 54.7	58	22 22.1	+110
20	10 51.1	167 37.2	19.0	185 43.2	25.8	6 22.2	22.0	178 22.3	52.9	65 19.5	59	22 11.1	+112
21	25 53.6	182 37.1	20.0	200 44.4	26.3	21 24.6	22.0	193 24.6	53.0	79 44.4	61	21 59.9	+113
22	40 56.0	197 36.9	20.9	215 45.6	26.9	36 27.1	22.0	208 26.8	53.0	94 09.5	62	21 48.6	+114
23	55 58.5	212 36.7	21.8	230 46.7	27.4	51 29.5	22.0	223 29.1	53.1	108 34.7	63	21 37.2	+115
24	71 01.0	227 36.6	− 7 22.8	245 47.9	− 0 27.9	66 32.0	+ 0 22.1	238 31.4	− 2 53.2	123 00.0	64	−21 25.7	+117
code	—	− 1	− 9	+ 11	− 6	+ 24	0	+ 23	− 1				

GCT	SUN GHA	SUN Dec.
h	° ′	° ′
0	182 55.4	−21 28.8
1	197 55.2	29.3
2	212 54.9	29.7
3	227 54.7 ••	30.1
4	242 54.5	30.5
5	257 54.3	30.9
6	272 54.0	−21 31.4
7	287 53.8	31.8
8	302 53.6	32.2
9	317 53.4 ••	32.6
10	332 53.2	33.0
11	347 52.9	33.5
12	2 52.7	−21 33.9
13	17 52.5	34.3
14	32 52.3	34.7
15	47 52.0 ••	35.1
16	62 51.8	35.5
17	77 51.6	35.9
18	92 51.4	−21 36.4
19	107 51.1	36.8
20	122 50.9	37.2
21	137 50.7 ••	37.6
22	152 50.4	38.0
23	167 50.2	38.4
0	182 50.0	−21 38.8
1	197 49.8	39.2
2	212 49.5	39.6
3	227 49.3 ••	40.0
4	242 49.1	40.4
5	257 48.8	40.8
6	272 48.6	−21 41.2
7	287 48.4	41.6
8	302 48.2	42.0
9	317 47.9 ••	42.4
10	332 47.7	42.8
11	347 47.5	43.2
12	2 47.2	−21 43.6
13	17 47.0	44.0
14	32 46.8	44.4
15	47 46.5 ••	44.8
16	62 46.3	45.2
17	77 46.1	45.6
18	92 45.8	−21 46.0
19	107 45.6	46.4
20	122 45.4	46.8
21	137 45.1 ••	47.2
22	152 44.9	47.6
23	167 44.7	48.0
0	182 44.4	−21 48.4
1	197 44.2	48.8
2	212 44.0	49.1
3	227 43.7 ••	49.5
4	242 43.5	49.9
5	257 43.3	50.3
6	272 43.0	−21 50.7
7	287 42.8	51.1
8	302 42.6	51.5
9	317 42.3 ••	51.8
10	332 42.1	52.2
11	347 41.8	52.6
12	2 41.6	−21 53.0
13	17 41.4	53.4
14	32 41.1	53.7
15	47 40.9 ••	54.1
16	62 40.7	54.5
17	77 40.4	54.9
18	92 40.2	−21 55.3
19	107 39.9	55.6
20	122 39.7	56.0
21	137 39.5 ••	56.4
22	152 39.2	56.8
23	167 39.0	57.1
24	182 38.7	−21 57.5
code	—	− 4

No.	STARS SHA	Dec.	Transit Mer. Gr.
	° ′	° ′	h m
1	358 31.4	+28 49.7	19 27
2	358 20.9	+58 53.4	19 27
3	349 42.0	−18 15.0	20 02
4	339 19.9	+59 59.5	20 43
5	336 00.4	−57 28.9	20 56
6	332 19.7	+89 02.6	21 11
7	328 52.8	+23 14.4	21 25
8	315 52.9	−40 29.7	22 17
9	309 46.3	+49 41.8	22 41
10	291 42.2	+16 25.0	23 53
11	281 56.2	− 8 15.1	0 36
12	281 42.4	+45 57.2	0 37
13	279 21.3	+ 6 18.6	0 46
14	279 10.8	+28 34.3	0 47
15	276 33.0	− 1 13.7	0 57
16	271 51.1	+ 7 24.2	1 16
17	264 16.2	−52 39.8	1 46
18	259 14.2	−16 38.7	2 07
19	255 48.6	−28 54.1	2 20
20	245 47.9	+ 5 21.1	3 00
21	244 24.0	+28 08.7	3 06
22	234 36.8	−59 20.9	3 45
23	223 26.5	−43 13.9	4 29
24	221 49.7	−69 30.8	4 36
25	218 41.5	− 8 26.8	4 48
26	208 32.6	+12 12.2	5 29
27	194 48.1	+62 00.4	6 24
28	183 20.9	+14 50.4	7 09
29	174 01.8	−62 49.7	7 46
30	172 53.1	−56 50.4	7 51
31	168 47.0	−59 25.4	8 07
32	167 01.3	+56 13.0	8 14
33	159 30.3	+55 10.3	8 44
34	159 20.3	−10 54.6	8 45
35	153 35.5	+49 32.9	9 08
36	149 02.6	−36 08.0	9 26
37	146 38.2	+19 25.8	9 36
38	140 55.9	−60 38.3	9 58
39	137 18.5	+74 20.9	10 13
40	126 50.5	+26 52.4	10 55
41	120 38.0	−22 29.2	11 19
42	113 23.5	−26 19.7	11 48
43	109 07.5	−68 56.7	12 05
44	103 06.0	−15 40.1	12 29
45	97 25.2	−37 04.4	12 52
46	96 49.7	+12 35.5	12 54
47	91 08.2	+51 29.6	13 17
48	84 45.5	−34 24.7	13 43
49	81 10.7	+38 44.3	13 57
50	76 55.9	−26 21.7	14 14
51	62 53.6	+ 8 44.4	15 10
52	54 32.2	−56 53.8	15 43
53	50 03.4	+45 06.6	16 01
54	34 32.7	+ 9 39.3	17 03
55	28 41.7	−47 11.9	17 26
56	16 14.8	−29 52.8	18 16
57	14 24.5	+14 56.9	18 23

Lat.	Sunrise	Twlt. begins	Moonrise 30	1	2	3
N °	h m	h m	h m	h m	h m	h m
70	■	6 15	■	■	■	14 49
68	10 32	6 09	■	■	■	14 06
66	9 44	6 05	■	■	14 28	13 38
64	9 14	6 00	■	■	13 35	13 16
62	8 52	5 56	■	13 10	13 03	12 58
60	8 34	5 53	11 49	12 26	12 39	12 43
58	8 19	5 50	11 11	11 57	12 19	12 30
56	8 06	5 46	10 44	11 34	12 03	12 19
54	7 55	5 43	10 23	11 16	11 49	12 10
52	7 45	5 40	10 05	11 00	11 37	12 01
50	7 36	5 37	9 50	10 46	11 26	11 53
45	7 17	5 31	9 19	10 18	11 03	11 36
40	7 02	5 25	8 55	9 56	10 45	11 22
35	6 49	5 19	8 36	9 38	10 29	11 10
30	6 38	5 13	8 19	9 22	10 16	11 00
20	6 18	5 00	7 51	8 55	9 53	10 42
10	6 01	4 47	7 26	8 32	9 32	10 26
0	5 45	4 31	7 04	8 10	9 14	10 12
10	5 29	4 12	6 41	7 49	8 55	9 57
20	5 12	3 49	6 17	7 25	8 35	9 41
30	4 51	3 17	5 49	6 58	8 11	9 23
35	4 39	2 56	5 32	6 42	7 57	9 12
40	4 26	2 28	5 13	6 24	7 41	9 00
45	4 09	1 49	4 50	6 01	7 22	8 45
50	3 49	0 20	4 20	5 33	6 58	8 27
52	3 39	////	4 05	5 18	6 46	8 19
54	3 29	////	3 48	5 02	6 33	8 09
56	3 16	////	3 28	4 42	6 18	7 58
58	3 02	////	3 02	4 18	6 00	7 46
60	2 44	////	2 27	3 46	5 37	7 31
S						

Lat.	Sunset	Twlt. ends	Moonset 30	1	2	3
N °	h m	h m	h m	h m	h m	h m
70	■	17 20	■	■	■	18 24
68	13 05	17 26	■	■	■	19 04
66	13 53	17 31	■	■	16 44	19 32
64	14 23	17 35	■	■	17 35	19 52
62	14 46	17 40	■	15 50	18 07	20 09
60	15 04	17 43	14 52	16 33	18 30	20 23
58	15 19	17 47	15 30	17 02	18 49	20 35
56	15 32	17 50	15 57	17 24	19 05	20 45
54	15 43	17 53	16 18	17 42	19 18	20 54
52	15 53	17 56	16 36	17 58	19 30	21 02
50	16 02	17 59	16 51	18 11	19 40	21 09
45	16 20	18 05	17 21	18 38	20 01	21 24
40	16 36	18 12	17 45	19 00	20 19	21 36
35	16 49	18 18	18 04	19 18	20 33	21 47
30	17 00	18 24	18 21	19 33	20 46	21 56
20	17 19	18 37	18 49	19 59	21 07	22 11
10	17 36	18 51	19 13	20 21	21 25	22 25
0	17 53	19 07	19 36	20 41	21 42	22 37
10	18 09	19 26	19 58	21 01	21 59	22 50
20	18 26	19 49	20 22	21 23	22 17	23 03
30	18 47	20 21	20 50	21 48	22 37	23 18
35	18 58	20 42	21 06	22 03	22 49	23 27
40	19 12	21 10	21 25	22 20	23 03	23 36
45	19 29	21 51	21 48	22 40	23 18	23 48
50	19 49	23 26	22 17	23 05	23 38	24 01
52	19 59	////	22 32	23 17	23 47	24 07
54	20 10	////	22 48	23 31	23 57	24 14
56	20 22	////	23 08	23 47	24 09	0 09
58	20 37	////	23 33	24 06	0 06	0 22
60	20 54	////	24 05	0 05	0 29	0 37
S						

GCT	Equation of Time (App.—Mean) 30	1	2
h	m s	m s	m s
0	+11 42.0	+11 20.4	+10 58.3
6	+11 36.6	+11 14.9	+10 52.6
12	+11 31.3	+11 09.4	+10 46.9
18	+11 25.9	+11 03.9	+10 41.2
24	+11 20.4	+10 58.3	+10 35.4

GCT of Transit Meridian of Greenwich DAY	Moon	Venus	Mars	Jupiter	Saturn
	h m	h m	h m	h m	h m
30	13 20	8 49	7 42	19 42	8 16
1	14 26	8 49	7 40	19 39	8 12
2	15 28	8 49	7 38	19 35	8 08
3	16 25	8 50	7 36	19 31	8 05

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb	Venus	Mars
°	′	′	′
0			
	0.6	0.2	0.1
30			
	0.6	0.1	0.1
45			
	0.6	0.1	0.0
60			
	0.6	0.1	0.0
75			
	0.6	0.0	0.0
90			

Moon's Lower Limb
Add

Alt.	30	1	2
°	′	′	′
0			
	20.5	20.3	19.7
4			
	20.5	20.2	19.7
8			
	20.5	20.2	19.7
12			
	20.4	20.1	19.7
16			
	20.3	20.1	19.6
20			
	20.2	20.0	19.5
24			
	20.1	19.9	19.4
28			
	20.0	19.8	19.3
32			
	19.8	19.6	19.2
36			
	19.7	19.5	19.1
40			
	19.5	19.3	18.9
44			
	19.3	19.1	18.7
48			
	19.1	18.9	18.6
52			
	18.9	18.7	18.4
56			
	18.7	18.5	18.2
60			
	18.4	18.3	18.0
64			
	18.2	18.1	17.8
68			
	17.9	17.8	17.6
72			
	17.7	17.6	17.4
76			
	17.4	17.3	17.1
80			
	17.2	17.1	16.9
84			
	16.9	16.8	16.7
88			
	16.7	16.6	16.5
90			

Add to table, back cover

Moon's Upper Limb
Subtract

Alt.	30	1	2
°	′	′	′
0			
	12.7	12.9	13.2
4			
	12.7	12.9	13.2
8			
	12.8	12.9	13.2
12			
	12.8	13.0	13.2
16			
	12.9	13.0	13.3
20			
	13.0	13.1	13.4
24			
	13.1	13.2	13.5
28			
	13.2	13.4	13.6
32			
	13.4	13.5	13.7
36			
	13.5	13.6	13.8
40			
	13.7	13.8	14.0
44			
	13.9	14.0	14.2
48			
	14.1	14.2	14.3
52			
	14.3	14.4	14.5
56			
	14.5	14.6	14.7
60			
	14.8	14.8	14.9
64			
	15.0	15.1	15.1
68			
	15.3	15.3	15.3
72			
	15.5	15.5	15.5
76			
	15.8	15.8	15.8
80			
	16.1	16.0	16.0
84			
	16.3	16.3	16.2
88			
	16.5	16.5	16.4
90			

Subtract from table, back cover

First Sunday in Advent 2

GCT	♈	VENUS −3.9		MARS 1.6		JUPITER −2.2		SATURN 1.0		MOON			
	GHA	GHA	Dec.	GHA	Dec.	GHA	Dec.	GHA	Dec	GHA	code	Dec.	code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
0	71 01.0	227 36.6	− 7 22.8	245 47.9	− 0 27.9	66 32.0	+ 0 22.1	238 31.4	− 2 53.2	123 00.0	64	−21 25.7	+117
1	86 03.4	242 36.4	23.7	260 49.1	28.5	81 34.4	22.1	253 33.6	53.3	137 25.4	66	21 14.0	+117
2	101 05.9	257 36.2	24.6	275 50.2	29.0	96 36.9	22.1	268 35.9	53.3	151 51.0	67	21 02.3	+119
3	116 08.3	272 36.0	·· 25.6	290 51.4	·· 29.6	111 39.3	·· 22.1	283 38.2	·· 53.4	166 16.7	69	·20 50.4	+121
4	131 10.8	287 35.9	26.5	305 52.6	30.1	126 41.8	22.2	298 40.4	53.5	180 42.6	69	20 38.3	+121
5	146 13.3	302 35.7	27.4	320 53.7	30.7	141 44.2	22.2	313 42.7	53.6	195 08.5	71	20 26.2	+123
6	161 15.7	317 35.5	− 7 28.4	335 54.9	− 0 31.2	156 46.6	+ 0 22.2	328 45.0	− 2 53.6	209 34.6	73	−20 13.9	+123
7	176 18.2	332 35.3	29.3	350 56.1	31.8	171 49.1	22.2	343 47.2	53.7	224 00.9	73	20 01.6	+125
8	191 20.7	347 35.2	30.2	5 57.2	32.3	186 51.5	22.2	358 49.5	53.8	238 27.2	75	19 49.1	+126
9	206 23.1	2 35.0	·· 31.2	20 58.4	·· 32.9	201 54.0	·· 22.3	13 51.8	·· 53.9	252 53.7	76	·19 36.5	+127
10	221 25.6	17 34.8	32.1	35 59.6	33.4	216 56.4	22.3	28 54.0	53.9	267 20.3	78	19 23.8	+128
11	236 28.1	32 34.6	33.0	51 00.7	33.9	231 58.9	22.3	43 56.3	54.0	281 47.1	78	19 11.0	+129
12	251 30.5	47 34.5	− 7 34.0	66 01.9	− 0 34.5	247 01.3	+ 0 22.3	58 58.6	− 2 54.1	296 13.9	80	−18 58.1	+130
13	266 33.0	62 34.3	34.9	81 03.1	35.0	262 03.7	22.4	74 00.8	54.1	310 40.9	82	18 45.1	+131
14	281 35.5	77 34.1	35.8	96 04.2	35.6	277 06.2	22.4	89 03.1	54.2	325 08.1	82	18 32.0	+132
15	296 37.9	92 33.9	·· 36.8	111 05.4	·· 36.1	292 08.6	·· 22.4	104 05.4	·· 54.3	339 35.3	84	·18 18.8	+133
16	311 40.4	107 33.7	37.7	126 06.6	36.7	307 11.1	22.4	119 07.6	54.4	354 02.7	85	18 05.5	+134
17	326 42.8	122 33.6	38.6	141 07.7	37.2	322 13.5	22.4	134 09.9	54.4	8 30.2	86	17 52.1	+135
18	341 45.3	137 33.4	− 7 39.6	156 08.9	− 0 37.8	337 16.0	+ 0 22.5	149 12.2	− 2 54.5	22 57.8	87	−17 38.6	+136
19	356 47.8	152 33.2	40.5	171 10.1	38.3	352 18.4	22.5	164 14.4	54.6	37 25.5	89	17 25.0	+136
20	11 50.2	167 33.0	41.4	186 11.3	38.8	7 20.8	22.5	179 16.7	54.7	51 53.4	89	17 11.4	+138
21	26 52.7	182 32.8	·· 42.4	201 12.4	·· 39.4	22 23.3	·· 22.5	194 19.0	·· 54.7	66 21.3	91	·16 57.6	+138
22	41 55.2	197 32.6	43.3	216 13.6	39.9	37 25.7	22.6	209 21.2	54.8	80 49.4	92	16 43.8	+139
23	56 57.6	212 32.5	44.2	231 14.8	40.5	52 28.2	22.6	224 23.5	54.9	95 17.6	94	16 29.9	+140
0	72 00.1	227 32.3	− 7 45.2	246 15.9	− 0 41.0	67 30.6	+ 0 22.6	239 25.8	− 2 54.9	109 46.0	94	−16 15.9	+140
1	87 02.6	242 32.1	46.1	261 17.1	41.6	82 33.0	22.6	254 28.0	55.0	124 14.4	96	16 01.9	+142
2	102 05.0	257 31.9	47.0	276 18.3	42.1	97 35.5	22.7	269 30.3	55.1	138 43.0	96	15 47.7	+142
3	117 07.5	272 31.7	·· 48.0	291 19.4	·· 42.7	112 37.9	·· 22.7	284 32.6	·· 55.2	153 11.6	98	·15 33.5	+142
4	132 10.0	287 31.5	48.9	306 20.6	43.2	127 40.3	22.7	299 34.9	55.2	167 40.4	99	15 19.3	+144
5	147 12.4	302 31.3	49.9	321 21.8	43.7	142 42.8	22.7	314 37.1	55.3	182 09.3	100	15 04.9	+144
6	162 14.9	317 31.2	− 7 50.8	336 22.9	− 0 44.3	157 45.2	+ 0 22.8	329 39.4	− 2 55.4	196 38.3	102	−14 50.5	+145
7	177 17.3	332 31.0	51.7	351 24.1	44.8	172 47.7	22.8	344 41.7	55.5	211 07.5	102	14 36.0	+145
8	192 19.8	347 30.8	52.7	6 25.3	45.4	187 50.1	22.8	359 43.9	55.5	225 36.7	103	14 21.5	+146
9	207 22.3	2 30.6	·· 53.6	21 26.5	·· 45.9	202 52.5	·· 22.8	14 46.2	·· 55.6	240 06.0	104	·14 06.9	+147
10	222 24.7	17 30.4	54.5	36 27.6	46.5	217 55.0	22.9	29 48.5	55.7	254 35.4	106	13 52.2	+147
11	237 27.2	32 30.2	55.5	51 28.8	47.0	232 57.4	22.9	44 50.7	55.7	269 05.0	106	13 37.5	+148
12	252 29.7	47 30.0	− 7 56.4	66 30.0	− 0 47.5	247 59.8	+ 0 22.9	59 53.0	− 2 55.8	283 34.6	108	−13 22.7	+148
13	267 32.1	62 29.8	57.3	81 31.1	48.1	263 02.3	22.9	74 55.3	55.9	298 04.4	108	13 07.9	+149
14	282 34.6	77 29.6	58.3	96 32.3	48.6	278 04.7	23.0	89 57.6	56.0	312 34.2	110	12 53.0	+149
15	297 37.1	92 29.5	· 7 59.2	111 33.5	·· 49.2	293 07.1	·· 23.0	104 59.8	·· 56.0	327 04.2	110	·12 38.1	+150
16	312 39.5	107 29.3	8 00.1	126 34.7	49.7	308 09.6	23.0	120 02.1	56.1	341 34.2	111	12 23.1	+151
17	327 42.0	122 29.1	01.1	141 35.8	50.3	323 12.0	23.1	135 04.4	56.2	356 04.3	113	12 08.0	+151
18	342 44.5	137 28.9	− 8 02.0	156 37.0	− 0 50.8	338 14.4	+ 0 23.1	150 06.6	− 2 56.2	10 34.6	113	−11 52.9	+151
19	357 46.9	152 28.7	02.9	171 38.2	51.3	353 16.9	23.1	165 08.9	56.3	25 04.9	114	11 37.8	+152
20	12 49.4	167 28.5	03.9	186 39.3	51.9	8 19.3	23.1	180 11.2	56.4	39 35.3	115	11 22.6	+152
21	27 51.8	182 28.3	·· 04.8	201 40.5	·· 52.4	23 21.7	·· 23.2	195 13.5	·· 56.5	54 05.8	116	·11 07.4	+152
22	42 54.3	197 28.1	05.7	216 41.7	53.0	38 24.2	23.2	210 15.7	56.5	68 36.4	117	10 52.2	+153
23	57 56.8	212 27.9	06.7	231 42.9	53.5	53 26.6	23.2	225 18.0	56.6	83 07.1	118	10 36.9	+153
0	72 59.2	227 27.7	− 8 07.6	246 44.0	− 0 54.1	68 29.0	+ 0 23.2	240 20.3	− 2 56.7	97 37.9	118	−10 21.6	+154
1	88 01.7	242 27.5	08.5	261 45.2	54.6	83 31.4	23.3	255 22.5	56.7	112 08.7	120	10 06.2	+154
2	103 04.2	257 27.3	09.5	276 46.4	55.1	98 33.9	23.3	270 24.8	56.8	126 39.7	120	9 50.8	+154
3	118 06.6	272 27.1	·· 10.4	291 47.5	·· 55.7	113 36.3	·· 23.3	285 27.1	·· 56.9	141 10.7	121	· 9 35.4	+155
4	133 09.1	287 26.9	11.3	306 48.7	56.2	128 38.7	23.4	300 29.4	56.9	155 41.8	122	9 19.9	+155
5	148 11.6	302 26.7	12.3	321 49.9	56.8	143 41.2	23.4	315 31.6	57.0	170 13.0	123	9 04.4	+155
6	163 14.0	317 26.5	− 8 13.2	336 51.1	− 0 57.3	158 43.6	+ 0 23.4	330 33.9	− 2 57.1	184 44.3	123	− 8 48.9	+155
7	178 16.5	332 26.3	14.1	351 52.2	57.9	173 46.0	23.4	345 36.2	57.2	199 15.6	124	8 33.4	+156
8	193 18.9	347 26.1	15.1	6 53.4	58.4	188 48.5	23.5	0 38.5	57.2	213 47.0	125	8 17.8	+156
9	208 21.4	2 25.9	·· 16.0	21 54.6	·· 58.9	203 50.9	·· 23.5	15 40.7	·· 57.3	228 18.5	126	· 8 02.2	+156
10	223 23.9	17 25.7	16.9	36 55.8	0 59.5	218 53.3	23.5	30 43.0	57.4	242 50.1	126	7 46.6	+157
11	238 26.3	32 25.5	17.9	51 56.9	1 00.0	233 55.7	23.6	45 45.3	57.4	257 21.7	127	7 30.9	+156
12	253 28.8	47 25.3	− 8 18.8	66 58.1	− 1 00.6	248 58.2	+ 0 23.6	60 47.5	− 2 57.5	271 53.4	128	− 7 15.3	+157
13	268 31.3	62 25.1	19.7	81 59.3	01.1	264 00.6	23.6	75 49.8	57.6	286 25.2	128	6 59.6	+157
14	283 33.7	77 24.9	20.7	97 00.5	01.6	279 03.0	23.7	90 52.1	57.7	300 57.0	129	6 43.9	+157
15	298 36.2	92 24.7	·· 21.6	112 01.6	·· 02.2	294 05.4	·· 23.7	105 54.4	·· 57.7	315 28.9	130	· 6 28.2	+157
16	313 38.7	107 24.5	22.5	127 02.8	02.7	309 07.9	23.7	120 56.6	57.8	330 00.9	130	6 12.5	+157
17	328 41.1	122 24.3	23.5	142 04.0	03.3	324 10.3	23.7	135 58.9	57.9	344 32.9	131	5 56.8	+158
18	343 43.6	137 24.1	− 8 24.4	157 05.2	− 1 03.8	339 12.7	+ 0 23.8	151 01.2	− 2 57.9	359 05.0	131	− 5 41.0	+157
19	358 46.1	152 23.9	25.3	172 06.3	04.4	354 15.1	23.8	166 03.5	58.0	13 37.1	133	5 25.3	+158
20	13 48.5	167 23.7	26.3	187 07.5	04.9	9 17.6	23.8	181 05.7	58.1	28 09.4	132	5 09.5	+157
21	28 51.0	182 23.5	·· 27.2	202 08.7	·· 05.4	24 20.0	·· 23.9	196 08.0	·· 58.1	42 41.6	133	· 4 53.8	+158
22	43 53.4	197 23.3	28.1	217 09.9	06.0	39 22.4	23.9	211 10.3	58.2	57 13.9	134	4 38.0	+158
23	58 55.9	212 23.0	29.1	232 11.0	06.5	54 24.8	23.9	226 12.6	58.3	71 46.3	134	4 22.2	+158
24	73 58.4	227 22.8	− 8 30.0	247 12.2	− 1 07.1	69 27.3	+ 0 24.0	241 14.8	− 2 58.3	86 18.7	135	− 4 06.4	+158
code	—	− 2	− 9	+ 11	− 6	+ 25	0	+ 23	− 1				

GCT	SUN GHA	SUN Dec.
h	° ′	° ′
0	182 38.7	−21 57.5
1	197 38.5	57.9
2	212 38.3	58.2
3	227 38.0	•• 58.6
4	242 37.8	59.0
5	257 37.5	59.4
6	272 37.3	−21 59.7
7	287 37.0	22 00.1
8	302 36.8	00.5
9	317 36.6	•• 00.8
10	332 36.3	01.2
11	347 36.1	01.5
12	2 35.8	−22 01.9
13	17 35.6	02.3
14	32 35.3	02.6
15	47 35.1	•• 03.0
16	62 34.8	03.4
17	77 34.6	03.7
18	92 34.4	−22 04.1
19	107 34.1	04.4
20	122 33.9	04.8
21	137 33.6	•• 05.1
22	152 33.4	05.5
23	167 33.1	05.9
0	182 32.9	−22 06.2
1	197 32.6	06.6
2	212 32.4	06.9
3	227 32.1	•• 07.3
4	242 31.9	07.6
5	257 31.6	08.0
6	272 31.4	−22 08.3
7	287 31.1	08.7
8	302 30.9	09.0
9	317 30.6	•• 09.4
10	332 30.4	09.7
11	347 30.1	10.1
12	2 29.9	−22 10.4
13	17 29.6	10.8
14	32 29.4	11.1
15	47 29.1	•• 11.4
16	62 28.9	11.8
17	77 28.6	12.1
18	92 28.4	−22 12.5
19	107 28.1	12.8
20	122 27.9	13.1
21	137 27.6	•• 13.5
22	152 27.4	13.8
23	167 27.1	14.2
0	182 26.9	−22 14.5
1	197 26.6	14.8
2	212 26.4	15.2
3	227 26.1	•• 15.5
4	242 25.9	15.8
5	257 25.6	16.2
6	272 25.4	−22 16.5
7	287 25.1	16.8
8	302 24.8	17.2
9	317 24.6	•• 17.5
10	332 24.3	17.8
11	347 24.1	18.2
12	2 23.8	−22 18.5
13	17 23.6	18.8
14	32 23.3	19.1
15	47 23.1	•• 19.5
16	62 22.8	19.8
17	77 22.5	20.1
18	92 22.3	−22 20.4
19	107 22.0	20.8
20	122 21.8	21.1
21	137 21.5	•• 21.4
22	152 21.3	21.7
23	167 21.0	22.0
24	182 20.7	−22 22.4
code	—	− 4

STARS No.	SHA	Dec.	Transit Mer. Gr.
	° ′	° ′	h m
1	358 31.4	+28 49.7	19 15
2	358 20.9	+58 53.4	19 15
3	349 42.0	−18 15.0	19 50
4	339 19.9	+59 59.5	20 31
5	336 00.4	−57 28.9	20 45
6	332 20.2	+89 02.6	20 59
7	328 52.8	+23 14.4	21 13
8	315 52.9	−40 29.7	22 05
9	309 46.3	+49 41.8	22 29
10	291 42.2	+16 25.0	23 41
11	281 56.2	− 8 15.2	0 24
12	281 42.4	+45 57.2	0 25
13	279 21.3	+ 6 18.6	0 34
14	279 10.8	+28 34.3	0 35
15	276 33.0	− 1 13.7	0 46
16	271 51.1	+ 7 24.2	1 04
17	264 16.2	−52 39.9	1 35
18	259 14.2	−16 38.7	1 55
19	255 48.6	−28 54.1	2 08
20	245 47.9	+ 5 21.1	2 48
21	244 23.9	+28 08.7	2 54
22	234 36.8	−59 20.9	3 33
23	223 26.4	−43 14.0	4 18
24	221 49.6	−69 30.8	4 24
25	218 41.4	− 8 26.8	4 36
26	208 32.6	+12 12.2	5 17
27	194 48.0	+62 00.4	6 12
28	183 20.8	+14 50.4	6 57
29	174 01.8	−62 49.7	7 35
30	172 53.1	−56 50.4	7 39
31	168 47.0	−59 25.4	7 56
32	167 01.2	+56 12.9	8 03
33	159 30.2	+55 10.3	8 33
34	159 20.3	−10 54.6	8 33
35	153 35.4	+49 32.9	8 56
36	149 02.6	−36 08.0	9 14
37	146 38.1	+19 25.8	9 24
38	140 55.9	−60 38.3	9 47
39	137 18.4	+74 20.9	10 01
40	126 50.5	+26 52.4	10 43
41	120 38.0	−22 29.2	11 08
42	113 23.5	−26 19.7	11 37
43	109 07.5	−68 56.7	11 54
44	103 06.0	−15 40.1	12 18
45	97 25.2	−37 04.4	12 40
46	96 49.7	+12 35.5	12 43
47	91 08.2	+51 29.6	13 05
48	84 45.5	−34 24.7	13 31
49	81 10.7	+38 44.3	13 45
50	76 55.9	−26 21.7	14 02
51	62 53.6	+ 8 44.4	14 58
52	54 32.3	−56 53.7	15 31
53	50 03.4	+45 06.6	15 49
54	34 32.7	+ 9 39.3	16 51
55	28 41.7	−47 11.9	17 14
56	16 14.8	−29 52.8	18 04
57	14 24.5	+14 56.9	18 11

Lat.	Sunrise	Twlt. begins	Moonrise 3	4	5	6
N °	h m	h m	h m	h m	h m	h m
70	▬	6 21	14 49	13 48	13 14	12 48
68	10 51	6 16	14 06	13 30	13 06	12 47
66	9 55	6 10	13 38	13 16	13 00	12 46
64	9 22	6 06	13 16	13 04	12 54	12 45
62	8 58	6 01	12 58	12 53	12 49	12 45
60	8 40	5 58	12 43	12 44	12 45	12 44
58	8 24	5 54	12 30	12 37	12 41	12 44
56	8 11	5 50	12 19	12 30	12 37	12 43
54	7 59	5 47	12 10	12 24	12 34	12 43
52	7 49	5 44	12 01	12 18	12 31	12 43
50	7 40	5 41	11 53	12 13	12 29	12 42
45	7 20	5 34	11 36	12 02	12 23	12 42
40	7 05	5 28	11 22	11 53	12 18	12 41
35	6 52	5 21	11 10	11 45	12 14	12 41
30	6 40	5 14	11 00	11 38	12 10	12 40
20	6 20	5 01	10 42	11 25	12 04	12 40
10	6 03	4 47	10 26	11 15	11 58	12 39
0	5 46	4 32	10 12	11 04	11 53	12 38
10	5 30	4 12	9 57	10 54	11 48	12 38
20	5 12	3 49	9 41	10 43	11 42	12 37
30	4 51	3 16	9 23	10 31	11 35	12 36
35	4 39	2 55	9 12	10 24	11 31	12 36
40	4 25	2 26	9 00	10 15	11 27	12 36
45	4 08	1 45	8 45	10 06	11 22	12 35
50	3 47	////	8 27	9 54	11 16	12 35
52	3 37	////	8 19	9 48	11 13	12 34
54	3 26	////	8 09	9 42	11 10	12 34
56	3 13	////	7 58	9 36	11 07	12 34
58	2 58	////	7 46	9 28	11 03	12 34
60	2 40	////	7 31	9 19	10 59	12 33
S						

Lat.	Sunset	Twlt. ends	Moonset 3	4	5	6
N °	h m	h m	h m	h m	h m	h m
70	▬	17 16	18 24	21 12	23 25	25 27
68	12 49	17 23	19 04	21 28	23 30	25 24
66	13 45	17 28	19 32	21 40	23 35	25 22
64	14 17	17 32	19 52	21 51	23 38	25 20
62	14 41	17 37	20 09	22 00	23 41	25 18
60	15 00	17 41	20 23	22 07	23 44	25 17
58	15 16	17 45	20 35	22 14	23 47	25 15
56	15 29	17 48	20 45	22 19	23 49	25 14
54	15 41	17 52	20 54	22 25	23 51	25 13
52	15 51	17 55	21 02	22 29	23 52	25 12
50	16 00	17 58	21 09	22 34	23 54	25 11
45	16 19	18 04	21 24	22 43	23 57	25 09
40	16 35	18 12	21 36	22 50	24 00	0 00
35	16 48	18 18	21 47	22 57	24 03	0 03
30	17 00	18 25	21 56	23 02	24 05	0 05
20	17 20	18 38	22 11	23 12	24 09	0 09
10	17 37	18 52	22 25	23 20	24 12	0 12
0	17 54	19 08	22 37	23 28	24 15	0 15
10	18 10	19 27	22 50	23 36	24 18	0 18
20	18 28	19 51	23 03	23 44	24 21	0 21
30	18 49	20 24	23 18	23 53	24 24	0 24
35	19 01	20 46	23 27	23 58	24 26	0 26
40	19 15	21 14	23 36	24 04	0 04	0 28
45	19 32	21 57	23 48	24 11	0 11	0 31
50	19 53	////	24 01	0 01	0 19	0 34
52	20 03	////	24 07	0 07	0 23	0 35
54	20 14	////	24 14	0 14	0 27	0 37
56	20 27	////	0 09	0 22	0 31	0 38
58	20 42	////	0 22	0 31	0 37	0 40
60	21 00	////	0 37	0 41	0 42	0 42
S						

GCT	Equation of Time (App.—Mean) 3	4	5
h	m s	m s	m s
0	+10 35.4	+10 12.0	+ 9 48.0
6	+10 29.6	+10 06.1	+ 9 41.9
12	+10 23.8	+10 00.1	+ 9 35.8
18	+10 17.9	+ 9 54.1	+ 9 29.7
24	+10 12.0	+ 9 48.0	+ 9 23.5

GCT of Transit Meridian of Greenwich

DAY	Moon	Venus	Mars	Jupiter	Saturn
	h m	h m	h m	h m	h m
3	16 25	8 50	7 36	19 31	8 05
4	17 16	8 50	7 34	19 27	8 01
5	18 04	8 50	7 33	19 23	7 57
6	18 49	8 51	7 31	19 19	7 54

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb	Venus	Mars
°	′	′	′
0			
	0.6	0.2	0.1
30			
	0.6	0.1	0.1
45			
	0.6	0.1	0.1
60			
	0.6	0.1	0.0
75			
	0.6	0.0	0.0
90			

Moon's Lower Limb
Add

Alt.	3	4	5
°	′	′	′
0			
	19.1	18.2	17.3
4			
	19.1	18.2	17.3
8			
	19.1	18.2	17.3
12			
	19.0	18.2	17.3
16			
	19.0	18.1	17.3
20			
	18.9	18.1	17.2
24			
	18.8	18.0	17.2
28			
	18.7	17.9	17.1
32			
	18.6	17.9	17.1
36			
	18.5	17.8	17.0
40			
	18.4	17.7	17.0
44			
	18.3	17.6	16.9
48			
	18.1	17.5	16.8
52			
	18.0	17.4	16.8
56			
	17.8	17.2	16.7
60			
	17.6	17.1	16.6
64			
	17.5	17.0	16.5
68			
	17.3	16.8	16.4
72			
	17.1	16.7	16.3
76			
	16.9	16.6	16.2
80			
	16.7	16.4	16.1
84			
	16.5	16.3	16.0
88			
	16.4	16.2	16.0
90			

Add to table, back cover

Moon's Upper Limb
Subtract

Alt.	3	4	5
°	′	′	′
0			
	13.5	14.0	14.5
4			
	13.5	14.0	14.5
8			
	13.6	14.1	14.6
12			
	13.6	14.1	14.6
16			
	13.6	14.1	14.6
20			
	13.7	14.2	14.6
24			
	13.8	14.2	14.7
28			
	13.9	14.3	14.7
32			
	14.0	14.4	14.8
36			
	14.1	14.5	14.8
40			
	14.2	14.6	14.9
44			
	14.4	14.7	15.0
48			
	14.5	14.8	15.0
52			
	14.7	14.9	15.1
56			
	14.8	15.0	15.2
60			
	15.0	15.1	15.3
64			
	15.2	15.3	15.4
68			
	15.4	15.4	15.5
72			
	15.5	15.5	15.5
76			
	15.7	15.7	15.6
80			
	15.9	15.8	15.7
84			
	16.1	16.0	15.8
88			
	16.3	16.1	15.9
90			

Subtract from table, back cover

First Quarter 5

GCT	♈ GHA	VENUS −3.8 GHA	VENUS Dec.	MARS 1.6 GHA	MARS Dec.	JUPITER −2.2 GHA	JUPITER Dec.	SATURN 1.0 GHA	SATURN Dec.	MOON GHA	code	MOON Dec.	code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
0	73 58.4	227 22.8	− 8 30.0	247 12.2	− 1 07.1	69 27.3	+ 0 24.0	241 14.8	− 2 58.3	86 18.7	135	− 4 06.4	+158
1	89 00.8	242 22.6	30.9	262 13.4	07.6	84 29.7	24.0	256 17.1	58.4	100 51.2	135	3 50.6	+158
2	104 03.3	257 22.4	31.9	277 14.6	08.1	99 32.1	24.0	271 19.4	58.5	115 23.7	136	3 34.8	+157
3	119 05.8	272 22.2	·· 32.8	292 15.7	·· 08.7	114 34.5	·· 24.1	286 21.7	·· 58.6	129 56.3	136	· 3 19.1	+158
4	134 08.2	287 22.0	33.7	307 16.9	09.2	129 36.9	24.1	301 23.9	58.6	144 28.9	137	3 03.3	+158
5	149 10.7	302 21.8	34.7	322 18.1	09.8	144 39.4	24.1	316 26.2	58.7	159 01.6	137	2 47.5	+158
6	164 13.2	317 21.6	− 8 35.6	337 19.3	− 1 10.3	159 41.8	+ 0 24.1	331 28.5	− 2 58.8	173 34.3	137	− 2 31.7	+158
7	179 15.6	332 21.4	36.5	352 20.4	10.8	174 44.2	24.2	346 30.8	58.8	188 07.0	138	2 15.9	+157
8	194 18.1	347 21.2	37.5	7 21.6	11.4	189 46.6	24.2	1 33.0	58.9	202 39.8	138	2 00.2	+158
9	209 20.6	2 20.9	·· 38.4	22 22.8	·· 11.9	204 49.0	·· 24.2	16 35.3	·· 59.0	217 12.6	139	· 1 44.4	+158
10	224 23.0	17 20.7	39.3	37 24.0	12.5	219 51.5	24.3	31 37.6	59.0	231 45.5	139	1 28.6	+157
11	239 25.5	32 20.5	40.3	52 25.1	13.0	234 53.9	24.3	46 39.9	59.1	246 18.4	139	1 12.9	+157
12	254 27.9	47 20.3	− 8 41.2	67 26.3	− 1 13.5	249 56.3	+ 0 24.3	61 42.1	− 2 59.2	260 51.3	140	− 0 57.2	+158
13	269 30.4	62 20.1	42.1	82 27.5	14.1	264 58.7	24.4	76 44.4	59.2	275 24.3	140	0 41.4	+157
14	284 32.9	77 19.9	43.1	97 28.7	14.6	280 01.1	24.4	91 46.7	59.3	289 57.3	140	0 25.7	+157
15	299 35.3	92 19.6	·· 44.0	112 29.8	·· 15.2	295 03.6	·· 24.4	106 49.0	·· 59.4	304 30.3	141	− 0 10.0	+156
16	314 37.8	107 19.4	44.9	127 31.0	15.7	310 06.0	24.5	121 51.2	59.5	319 03.4	141	+ 0 05.6	+157
17	329 40.3	122 19.2	45.9	142 32.2	16.2	325 08.4	24.5	136 53.5	59.5	333 36.5	141	0 21.3	+157
18	344 42.7	137 19.0	− 8 46.8	157 33.4	− 1 16.8	340 10.8	+ 0 24.5	151 55.8	− 2 59.6	348 09.6	142	+ 0 37.0	+156
19	359 45.2	152 18.8	47.7	172 34.6	17.3	355 13.2	24.6	166 58.1	59.7	2 42.8	141	0 52.6	+156
20	14 47.7	167 18.6	48.7	187 35.7	17.8	10 15.6	24.6	182 00.4	59.7	17 15.9	142	1 08.2	+156
21	29 50.1	182 18.3	·· 49.6	202 36.9	·· 18.4	25 18.1	·· 24.6	197 02.6	·· 59.8	31 49.1	142	· 1 23.8	+156
22	44 52.6	197 18.1	50.5	217 38.1	18.9	40 20.5	24.7	212 04.9	59.9	46 22.3	143	1 39.4	+155
23	59 55.1	212 17.9	51.5	232 39.3	19.5	55 22.9	24.7	227 07.2	2 59.9	60 55.6	142	1 54.9	+156
0	74 57.5	227 17.7	− 8 52.4	247 40.4	− 1 20.0	70 25.3	+ 0 24.8	242 09.5	− 3 00.0	75 28.8	143	+ 2 10.5	+155
1	90 00.0	242 17.5	53.3	262 41.6	20.5	85 27.7	24.8	257 11.7	00.1	90 02.1	143	2 26.0	+154
2	105 02.4	257 17.2	54.3	277 42.8	21.1	100 30.1	24.8	272 14.0	00.1	104 35.4	143	2 41.4	+155
3	120 04.9	272 17.0	·· 55.2	292 44.0	·· 21.6	115 32.5	·· 24.9	287 16.3	·· 00.2	119 08.7	143	· 2 56.9	+154
4	135 07.4	287 16.8	56.1	307 45.2	22.2	130 35.0	24.9	302 18.6	00.3	133 42.0	143	3 12.3	+154
5	150 09.8	302 16.6	57.1	322 46.3	22.7	145 37.4	24.9	317 20.9	00.3	148 15.3	143	3 27.7	+154
6	165 12.3	317 16.3	− 8 58.0	337 47.5	− 1 23.2	160 39.8	+ 0 25.0	332 23.1	− 3 00.4	162 48.6	144	+ 3 43.1	+153
7	180 14.8	332 16.1	58.9	352 48.7	23.8	175 42.2	25.0	347 25.4	00.5	177 22.0	143	3 58.4	+153
8	195 17.2	347 15.9	8 59.9	7 49.9	24.3	190 44.6	25.0	2 27.7	00.5	191 55.3	144	4 13.7	+153
9	210 19.7	2 15.7	· 9 00.8	22 51.0	·· 24.8	205 47.0	·· 25.1	17 30.0	·· 00.6	206 28.7	144	· 4 29.0	+152
10	225 22.2	17 15.4	01.7	37 52.2	25.4	220 49.4	25.1	32 32.2	00.7	221 02.1	143	4 44.2	+152
11	240 24.6	32 15.2	02.7	52 53.4	25.9	235 51.8	25.1	47 34.5	00.7	235 35.4	144	4 59.4	+152
12	255 27.1	47 15.0	− 9 03.6	67 54.6	− 1 26.5	250 54.2	+ 0 25.2	62 36.8	− 3 00.8	250 08.8	144	+ 5 14.6	+151
13	270 29.5	62 14.8	04.5	82 55.8	27.0	265 56.7	25.2	77 39.1	00.9	264 42.2	144	5 29.7	+151
14	285 32.0	77 14.5	05.4	97 56.9	27.5	280 59.1	25.3	92 41.4	01.0	279 15.6	143	5 44.8	+151
15	300 34.5	92 14.3	·· 06.4	112 58.1	·· 28.1	296 01.5	·· 25.3	107 43.6	·· 01.0	293 48.9	144	· 5 59.9	+150
16	315 36.9	107 14.1	07.3	127 59.3	28.6	311 03.9	25.3	122 45.9	01.1	308 22.3	144	6 14.9	+150
17	330 39.4	122 13.8	08.2	143 00.5	29.1	326 06.3	25.4	137 48.2	01.2	322 55.7	144	6 29.9	+149
18	345 41.9	137 13.6	− 9 09.2	158 01.7	− 1 29.7	341 08.7	+ 0 25.4	152 50.5	− 3 01.2	337 29.1	143	+ 6 44.8	+149
19	0 44.3	152 13.4	10.1	173 02.8	30.2	356 11.1	25.4	167 52.8	01.3	352 02.4	144	6 59.7	+149
20	15 46.8	167 13.1	11.0	188 04.0	30.8	11 13.5	25.5	182 55.0	01.4	6 35.8	143	7 14.6	+148
21	30 49.3	182 12.9	·· 12.0	203 05.2	·· 31.3	26 15.9	·· 25.5	197 57.3	·· 01.4	21 09.1	144	· 7 29.4	+148
22	45 51.7	197 12.7	12.9	218 06.4	31.8	41 18.3	25.6	212 59.6	01.5	35 42.5	143	7 44.2	+147
23	60 54.2	212 12.4	13.8	233 07.6	32.4	56 20.7	25.6	228 01.9	01.6	50 15.8	143	7 58.9	+147
0	75 56.7	227 12.2	− 9 14.8	248 08.7	− 1 32.9	71 23.2	+ 0 25.6	243 04.2	− 3 01.6	64 49.1	144	+ 8 13.6	+146
1	90 59.1	242 12.0	15.7	263 09.9	33.4	86 25.6	25.7	258 06.4	01.7	79 22.5	143	8 28.2	+146
2	106 01.6	257 11.7	16.6	278 11.1	34.0	101 28.0	25.7	273 08.7	01.8	93 55.8	142	8 42.8	+145
3	121 04.0	272 11.5	·· 17.5	293 12.3	·· 34.5	116 30.4	·· 25.7	288 11.0	·· 01.8	108 29.0	143	· 8 57.3	+145
4	136 06.5	287 11.3	18.5	308 13.5	35.0	131 32.8	25.8	303 13.3	01.9	123 02.3	143	9 11.8	+144
5	151 09.0	302 11.0	19.4	323 14.7	35.6	146 35.2	25.8	318 15.6	02.0	137 35.6	142	9 26.2	+144
6	166 11.4	317 10.8	− 9 20.3	338 15.8	− 1 36.1	161 37.6	+ 0 25.9	333 17.9	− 3 02.0	152 08.8	142	+ 9 40.6	+143
7	181 13.9	332 10.6	21.3	353 17.0	36.7	176 40.0	25.9	348 20.1	02.1	166 42.0	142	9 54.9	+143
8	196 16.4	347 10.3	22.2	8 18.2	37.2	191 42.4	25.9	3 22.4	02.2	181 15.2	142	10 09.2	+142
9	211 18.8	2 10.1	·· 23.1	23 19.4	·· 37.7	206 44.8	·· 26.0	18 24.7	·· 02.2	195 48.4	142	·10 23.4	+141
10	226 21.3	17 09.8	24.1	38 20.6	38.3	221 47.2	26.0	33 27.0	02.3	210 21.6	141	10 37.5	+142
11	241 23.8	32 09.6	25.0	53 21.7	38.8	236 49.6	26.1	48 29.3	02.4	224 54.7	141	10 51.7	+140
12	256 26.2	47 09.4	− 9 25.9	68 22.9	− 1 39.3	251 52.0	+ 0 26.1	63 31.5	− 3 02.4	239 27.8	141	+11 05.7	+140
13	271 28.7	62 09.1	26.8	83 24.1	39.9	266 54.4	26.1	78 33.8	02.5	254 00.9	141	11 19.7	+139
14	286 31.2	77 08.9	27.8	98 25.3	40.4	281 56.8	26.2	93 36.1	02.6	268 34.0	140	11 33.6	+139
15	301 33.6	92 08.6	·· 28.7	113 26.5	·· 40.9	296 59.2	·· 26.2	108 38.4	·· 02.6	283 07.0	140	·11 47.5	+138
16	316 36.1	107 08.4	29.6	128 27.7	41.5	312 01.6	26.3	123 40.7	02.7	297 40.0	140	12 01.3	+137
17	331 38.5	122 08.2	30.6	143 28.8	42.0	327 04.0	26.3	138 43.0	02.8	312 13.0	140	12 15.0	+137
18	346 41.0	137 07.9	− 9 31.5	158 30.0	− 1 42.5	342 06.4	+ 0 26.3	153 45.2	− 3 02.8	326 46.0	139	+12 28.7	+136
19	1 43.5	152 07.7	32.4	173 31.2	43.1	357 08.8	26.4	168 47.5	02.9	341 18.9	139	12 42.3	+136
20	16 45.9	167 07.4	33.4	188 32.4	43.6	12 11.2	26.4	183 49.8	02.9	355 51.8	138	12 55.9	+135
21	31 48.4	182 07.2	·· 34.3	203 33.6	·· 44.1	27 13.6	·· 26.5	198 52.1	·· 03.0	10 24.6	139	·13 09.4	+134
22	46 50.9	197 06.9	35.2	218 34.8	44.7	42 16.0	26.5	213 54.4	03.1	24 57.5	138	13 22.8	+133
23	61 53.3	212 06.7	36.1	233 35.9	45.2	57 18.4	26.5	228 56.7	03.1	39 30.3	137	13 36.1	+133
24	76 55.8	227 06.4	− 9 37.1	248 37.1	− 1 45.8	72 20.8	+ 0 26.6	243 58.9	− 3 03.2	54 03.0	138	+13 49.4	+132
code	—	− 2	− 9	+ 12	− 5	+ 25	0	+ 23	− 1				

GCT	SUN GHA	SUN Dec.
h	° ′	° ′
0	182 20.7	−22 22.4
1	197 20.5	22.7
2	212 20.2	23.0
3	227 20.0 ··	23.3
4	242 19.7	23.6
5	257 19.4	23.9
6	272 19.2	−22 24.3
7	287 18.9	24.6
8	302 18.7	24.9
9	317 18.4 ··	25.2
10	332 18.1	25.5
11	347 17.9	25.8
12	2 17.6	−22 26.1
13	17 17.4	26.4
14	32 17.1	26.7
15	47 16.8 ··	27.0
16	62 16.6	27.4
17	77 16.3	27.7
18	92 16.0	−22 28.0
19	107 15.8	28.3
20	122 15.5	28.6
21	137 15.3 ··	28.9
22	152 15.0	29.2
23	167 14.7	29.5
0	182 14.5	−22 29.8
1	197 14.2	30.1
2	212 13.9	30.4
3	227 13.7 ··	30.7
4	242 13.4	31.0
5	257 13.1	31.3
6	272 12.9	−22 31.6
7	287 12.6	31.9
8	302 12.3	32.1
9	317 12.1 ··	32.4
10	332 11.8	32.7
11	347 11.5	33.0
12	2 11.3	−22 33.3
13	17 11.0	33.6
14	32 10.7	33.9
15	47 10.5 ··	34.2
16	62 10.2	34.5
17	77 09.9	34.8
18	92 09.7	−22 35.1
19	107 09.4	35.3
20	122 09.1	35.6
21	137 08.9 ··	35.9
22	152 08.6	36.2
23	167 08.3	36.5
0	182 08.1	−22 36.8
1	197 07.8	37.0
2	212 07.5	37.3
3	227 07.3 ··	37.6
4	242 07.0	37.9
5	257 06.7	38.2
6	272 06.5	−22 38.4
7	287 06.2	38.7
8	302 05.9	39.0
9	317 05.6 ··	39.3
10	332 05.4	39.5
11	347 05.1	39.8
12	2 04.8	−22 40.1
13	17 04.6	40.3
14	32 04.3	40.6
15	47 04.0 ··	40.9
16	62 03.7	41.2
17	77 03.5	41.4
18	92 03.2	−22 41.7
19	107 02.9	42.0
20	122 02.6	42.2
21	137 02.4 ··	42.5
22	152 02.1	42.8
23	167 01.8	43.0
24	182 01.6	−22 43.3
code	—	− 3

No.	STARS SHA	Dec.	Transit Mer. Gr.
	° ′	° ′	h m
1	358 31.4	+28 49.7	19 03
2	358 20.9	+58 53.4	19 04
3	349 42.0	−18 15.0	19 38
4	339 19.9	+59 59.5	20 19
5	336 00.4	−57 28.9	20 33
6	332 20.8	+89 02.7	20 47
7	328 52.8	+23 14.4	21 01
8	315 52.9	−40 29.7	21 53
9	309 46.3	+49 41.8	22 17
10	291 42.2	+16 25.0	23 29
11	281 56.2	− 8 15.2	0 12
12	281 42.4	+45 57.2	0 13
13	279 21.3	+ 6 18.6	0 23
14	279 10.7	+28 34.3	0 23
15	276 33.0	− 1 13.7	0 34
16	271 51.0	+ 7 24.1	0 53
17	264 16.2	−52 39.9	1 23
18	259 14.2	−16 38.7	1 43
19	255 48.6	−28 54.1	1 57
20	245 47.8	+ 5 21.1	2 37
21	244 23.9	+28 08.7	2 42
22	234 36.7	−59 20.9	3 21
23	223 26.4	−43 14.0	4 06
24	221 49.6	−69 30.8	4 12
25	218 41.4	− 8 26.8	4 25
26	208 32.6	+12 12.2	5 05
27	194 48.0	+62 00.4	6 00
28	183 20.8	+14 50.4	6 46
29	174 01.7	−62 49.7	7 23
30	172 53.0	−56 50.4	7 27
31	168 46.9	−59 25.4	7 44
32	167 01.2	+56 12.9	7 51
33	159 30.2	+55 10.3	8 21
34	159 20.3	−10 54.7	8 21
35	153 35.4	+49 32.9	8 44
36	149 02.6	−36 08.0	9 03
37	146 38.1	+19 25.8	9 12
38	140 55.8	−60 38.3	9 35
39	137 18.4	+74 20.8	9 49
40	126 50.5	+26 52.4	10 31
41	120 38.0	−22 29.3	10 56
42	113 23.4	−26 19.7	11 25
43	109 07.5	−68 56.6	11 42
44	103 06.0	−15 40.1	12 06
45	97 25.2	−37 04.4	12 28
46	96 49.7	+12 35.5	12 31
47	91 08.2	+51 29.6	12 54
48	84 45.5	−34 24.7	13 19
49	81 10.7	+38 44.3	13 33
50	76 55.9	−26 21.7	13 50
51	62 53.6	+ 8 44.4	14 46
52	54 32.3	−56 53.7	15 19
53	50 03.4	+45 06.6	15 37
54	34 32.7	+ 9 39.3	16 39
55	28 41.7	−47 11.9	17 03
56	16 14.8	−29 52.8	17 52
57	14 24.5	+14 56.9	18 00

Lat.	Sunrise	Twlt. begins	Moonrise 6	7	8	9
N °	h m	h m	h m	h m	h m	h m
70	■	6 27	12 48	12 22	11 54	11 14
68	11 13	6 20	12 47	12 28	12 07	11 41
66	10 05	6 15	12 46	12 33	12 19	12 02
64	9 30	6 10	12 45	12 37	12 28	12 19
62	9 05	6 06	12 45	12 41	12 37	12 33
60	8 45	6 01	12 44	12 44	12 44	12 44
58	8 29	5 57	12 44	12 47	12 50	12 55
56	8 15	5 54	12 43	12 49	12 56	13 04
54	8 03	5 51	12 43	12 52	13 01	13 12
52	7 53	5 47	12 43	12 54	13 06	13 19
50	7 43	5 44	12 42	12 56	13 10	13 26
45	7 24	5 37	12 42	13 00	13 19	13 40
40	7 08	5 30	12 41	13 03	13 26	13 51
35	6 54	5 23	12 41	13 06	13 33	14 01
30	6 42	5 17	12 40	13 09	13 39	14 10
20	6 22	5 03	12 40	13 14	13 49	14 26
10	6 04	4 49	12 39	13 18	13 58	14 39
0	5 48	4 32	12 38	13 22	14 06	14 52
10	5 31	4 13	12 38	13 26	14 15	15 04
20	5 12	3 49	12 37	13 31	14 24	15 18
30	4 51	3 16	12 36	13 36	14 35	15 34
35	4 39	2 54	12 36	13 39	14 41	15 43
40	4 25	2 25	12 36	13 42	14 48	15 54
45	4 07	1 41	12 35	13 46	14 56	16 06
50	3 46	////	12 35	13 51	15 06	16 22
52	3 36	////	12 34	13 53	15 11	16 29
54	3 24	////	12 34	13 55	15 16	16 37
56	3 11	////	12 34	13 58	15 22	16 46
58	2 56	////	12 34	14 01	15 28	16 56
60	2 37	////	12 33	14 04	15 36	17 08
S						

Lat.	Sunset	Twlt. ends	Moonset 6	7	8	9
N °	h m	h m	h m	h m	h m	h m
70	■	17 13	25 27	1 27	3 29	5 43
68	12 29	17 20	25 24	1 24	3 18	5 18
66	13 37	17 25	25 22	1 22	3 08	4 58
64	14 12	17 30	25 20	1 20	3 00	4 43
62	14 38	17 36	25 18	1 18	2 54	4 30
60	14 57	17 39	25 17	1 17	2 48	4 19
58	15 13	17 43	25 15	1 15	2 43	4 10
56	15 27	17 47	25 14	1 14	2 38	4 02
54	15 39	17 51	25 13	1 13	2 34	3 55
52	15 50	17 54	25 12	1 12	2 30	3 48
50	15 59	17 57	25 11	1 11	2 27	3 42
45	16 19	18 05	25 09	1 09	2 20	3 30
40	16 35	18 12	0 00	1 08	2 14	3 20
35	16 48	18 18	0 03	1 06	2 09	3 11
30	17 00	18 25	0 05	1 05	2 04	3 03
20	17 20	18 38	0 09	1 03	1 56	2 50
10	17 38	18 53	0 12	1 01	1 50	2 39
0	17 55	19 10	0 15	0 59	1 43	2 28
10	18 12	19 29	0 18	0 58	1 37	2 17
20	18 30	19 53	0 21	0 56	1 30	2 06
30	18 51	20 26	0 24	0 54	1 23	1 53
35	19 04	20 49	0 26	0 52	1 18	1 46
40	19 18	21 19	0 28	0 51	1 13	1 37
45	19 35	22 02	0 31	0 49	1 08	1 27
50	19 57	////	0 34	0 47	1 01	1 16
52	20 07	////	0 35	0 46	0 58	1 10
54	20 19	////	0 37	0 45	0 54	1 04
56	20 32	////	0 38	0 44	0 51	0 58
58	20 47	////	0 40	0 43	0 46	0 50
60	21 06	////	0 42	0 42	0 42	0 42
S						

GCT	Equation of Time (App.—Mean) 6	7	8
h	m s	m s	m s
0	+ 9 23.5	+ 8 58.4	+ 8 32.8
6	+ 9 17.3	+ 8 52.0	+ 8 26.3
12	+ 9 11.0	+ 8 45.7	+ 8 19.8
18	+ 9 04.7	+ 8 39.3	+ 8 13.3
24	+ 8 58.4	+ 8 32.8	+ 8 06.8

GCT of Transit Meridian of Greenwich

DAY	Moon	Venus	Mars	Jupiter	Saturn
	h m	h m	h m	h m	h m
6	18 49	8 51	7 31	19 19	7 54
7	19 33	8 51	7 29	19 15	7 50
8	20 17	8 51	7 27	19 11	7 47
9	21 03	8 52	7 25	19 08	7 43

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb	Venus	Mars
°	′	′	′
0–30	0.6	0.2	0.1
30–45	0.6	0.1	0.1
45–60	0.6	0.1	0.1
60–75	0.6	0.1	0.0
75–90	0.6	0.0	0.0

Moon's Lower Limb
Add

Alt.	6	7	8
°	′	′	′
0–4	16.3	15.6	14.7
4–8	16.3	15.6	14.7
8–12	16.3	15.6	14.7
12–16	16.3	15.6	14.7
16–20	16.3	15.6	14.7
20–24	16.3	15.6	14.7
24–28	16.3	15.6	14.7
28–32	16.2	15.6	14.8
32–36	16.2	15.6	14.8
36–40	16.2	15.6	14.8
40–44	16.2	15.6	14.8
44–48	16.1	15.6	14.9
48–52	16.1	15.6	14.9
52–56	16.1	15.6	14.9
56–60	16.0	15.6	15.0
60–64	16.0	15.6	15.0
64–68	16.0	15.6	15.1
68–72	15.9	15.6	15.1
72–76	15.9	15.6	15.2
76–80	15.8	15.6	15.2
80–84	15.8	15.6	15.3
84–88	15.8	15.6	15.3
88–90	15.7	15.6	15.3

Add to table, back cover

Moon's Upper Limb
Subtract

Alt.	6	7	8
°	′	′	′
0–4	15.1	15.6	16.1
4–8	15.1	15.6	16.1
8–12	15.1	15.6	16.0
12–16	15.1	15.6	16.0
16–20	15.1	15.6	16.0
20–24	15.2	15.6	16.0
24–28	15.2	15.6	16.0
28–32	15.2	15.6	16.0
32–36	15.2	15.6	15.9
36–40	15.2	15.6	15.9
40–44	15.3	15.6	15.9
44–48	15.3	15.6	15.8
48–52	15.3	15.6	15.8
52–56	15.4	15.6	15.8
56–60	15.4	15.6	15.7
60–64	15.4	15.6	15.7
64–68	15.5	15.6	15.6
68–72	15.5	15.6	15.6
72–76	15.5	15.6	15.6
76–80	15.6	15.6	15.5
80–84	15.6	15.6	15.5
84–88	15.7	15.6	15.4
88–90	15.7	15.6	15.4

Subtract from table, back cover

G C T	♈ GHA	VENUS −3.8 GHA	Dec.	MARS 1.5 GHA	Dec.	JUPITER −2.2 GHA	Dec.	SATURN 1.0 GHA	Dec.	MOON GHA	code	Dec.	code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
0	76 55.8	227 06.4	− 9 37.1	248 37.1	− 1 45.8	72 20.8	+ 0 26.6	243 58.9	− 3 03.2	54 03.0	138	+13 49.4	+132
1	91 58.3	242 06.2	38.0	263 38.3	46.3	87 23.2	26.6	259 01.2	03.3	68 35.8	136	14 02.6	+132
2	107 00.7	257 06.0	38.9	278 39.5	46.8	102 25.6	26.7	274 03.5	03.3	83 08.4	137	14 15.8	+130
3	122 03.2	272 05.7	·· 39.9	293 40.7	·· 47.4	117 28.0	·· 26.7	289 05.8	·· 03.4	97 41.1	136	·14 28.8	+130
4	137 05.6	287 05.5	40.8	308 41.9	47.9	132 30.4	26.8	304 08.1	03.5	112 13.7	136	14 41.8	+130
5	152 08.1	302 05.2	41.7	323 43.0	48.4	147 32.8	26.8	319 10.4	03.5	126 46.3	135	14 54.8	+128
6	167 10.6	317 05.0	− 9 42.6	338 44.2	− 1 49.0	162 35.2	+ 0 26.8	334 12.6	− 3 03.6	141 18.8	135	+15 07.6	+128
7	182 13.0	332 04.7	43.6	353 45.4	49.5	177 37.6	26.9	349 14.9	03.7	155 51.3	135	15 20.4	+127
8	197 15.5	347 04.5	44.5	8 46.6	50.0	192 40.0	26.9	4 17.2	03.7	170 23.8	134	15 33.1	+126
9	212 18.0	2 04.2	·· 45.4	23 47.8	·· 50.6	207 42.4	·· 27.0	19 19.5	·· 03.8	184 56.2	134	·15 45.7	+126
10	227 20.4	17 04.0	46.3	38 49.0	51.1	222 44.8	27.0	34 21.8	03.9	199 28.6	133	15 58.3	+124
11	242 22.9	32 03.7	47.3	53 50.2	51.6	237 47.2	27.1	49 24.1	03.9	214 00.9	133	16 10.7	+124
12	257 25.4	47 03.4	− 9 48.2	68 51.3	− 1 52.2	252 49.6	+ 0 27.1	64 26.4	− 3 04.0	228 33.2	133	+16 23.1	+123
13	272 27.8	62 03.2	49.1	83 52.5	52.7	267 52.0	27.1	79 28.6	04.1	243 05.5	132	16 35.4	+123
14	287 30.3	77 02.9	50.1	98 53.7	53.2	282 54.4	27.2	94 30.9	04.1	257 37.7	131	16 47.7	+121
15	302 32.8	92 02.7	·· 51.0	113 54.9	·· 53.8	297 56.8	·· 27.2	109 33.2	·· 04.2	272 09.8	131	·16 59.8	+121
16	317 35.2	107 02.4	51.9	128 56.1	54.3	312 59.2	27.3	124 35.5	04.2	286 41.9	131	17 11.9	+119
17	332 37.7	122 02.2	52.8	143 57.3	54.8	328 01.6	27.3	139 37.8	04.3	301 14.0	130	17 23.8	+119
18	347 40.1	137 01.9	− 9 53.8	158 58.5	− 1 55.4	343 03.9	+ 0 27.4	154 40.1	− 3 04.4	315 46.0	130	+17 35.7	+118
19	2 42.6	152 01.7	54.7	173 59.6	55.9	358 06.3	27.4	169 42.4	04.4	330 18.0	129	17 47.5	+118
20	17 45.1	167 01.4	55.6	189 00.8	56.4	13 08.7	27.4	184 44.6	04.5	344 49.9	129	17 59.3	+116
21	32 47.5	182 01.2	·· 56.5	204 02.0	·· 57.0	28 11.1	·· 27.5	199 46.9	·· 04.6	359 21.8	128	·18 10.9	+115
22	47 50.0	197 00.9	57.5	219 03.2	57.5	43 13.5	27.5	214 49.2	04.6	13 53.6	128	18 22.4	+115
23	62 52.5	212 00.6	58.4	234 04.4	58.0	58 15.9	27.6	229 51.5	04.7	28 25.4	128	18 33.9	+114
0	77 54.9	227 00.4	− 9 59.3	249 05.6	− 1 58.6	73 18.3	+ 0 27.6	244 53.8	− 3 04.8	42 57.2	126	+18 45.3	+112
1	92 57.4	242 00.1	10 00.2	264 06.8	59.1	88 20.7	27.7	259 56.1	04.8	57 28.8	127	18 56.5	+112
2	107 59.9	256 59.9	01.2	279 07.9	1 59.6	103 23.1	27.7	274 58.4	04.9	72 00.5	125	19 07.7	+111
3	123 02.3	271 59.6	·· 02.1	294 09.1	· 2 00.1	118 25.5	·· 27.8	290 00.6	·· 05.0	86 32.0	126	·19 18.8	+110
4	138 04.8	286 59.3	03.0	309 10.3	00.7	133 27.9	27.8	305 02.9	05.0	101 03.6	125	19 29.8	+109
5	153 07.3	301 59.1	03.9	324 11.5	01.2	148 30.3	27.9	320 05.2	05.1	115 35.1	124	19 40.7	+108
6	168 09.7	316 58.8	−10 04.9	339 12.7	− 2 01.7	163 32.6	+ 0 27.9	335 07.5	− 3 05.1	130 06.5	124	+19 51.5	+107
7	183 12.2	331 58.5	05.8	354 13.9	02.3	178 35.0	27.9	350 09.8	05.2	144 37.9	123	20 02.2	+106
8	198 14.6	346 58.3	06.7	9 15.1	02.8	193 37.4	28.0	5 12.1	05.3	159 09.2	123	20 12.8	+105
9	213 17.1	1 58.0	·· 07.6	24 16.3	·· 03.3	208 39.8	·· 28.0	20 14.4	·· 05.3	173 40.5	122	·20 23.3	+104
10	228 19.6	16 57.8	08.6	39 17.4	03.9	223 42.2	28.1	35 16.7	05.4	188 11.7	121	20 33.7	+104
11	243 22.0	31 57.5	09.5	54 18.6	04.4	238 44.6	28.1	50 18.9	05.5	202 42.8	122	20 44.1	+102
12	258 24.5	46 57.2	−10 10.4	69 19.8	− 2 04.9	253 47.0	+ 0 28.2	65 21.2	− 3 05.5	217 14.0	120	+20 54.3	+101
13	273 27.0	61 57.0	11.3	84 21.0	05.5	268 49.4	28.2	80 23.5	05.6	231 45.0	120	21 04.4	+100
14	288 29.4	76 56.7	12.3	99 22.2	06.0	283 51.7	28.3	95 25.8	05.7	246 16.0	120	21 14.4	+ 99
15	303 31.9	91 56.4	·· 13.2	114 23.4	·· 06.5	298 54.1	·· 28.3	110 28.1	·· 05.7	260 47.0	119	·21 24.3	+ 98
16	318 34.4	106 56.2	14.1	129 24.6	07.1	313 56.5	28.4	125 30.4	05.8	275 17.9	118	21 34.1	+ 97
17	333 36.8	121 55.9	15.0	144 25.8	07.6	328 58.9	28.4	140 32.7	05.8	289 48.7	118	21 43.8	+ 96
18	348 39.3	136 55.6	−10 16.0	159 26.9	− 2 08.1	344 01.3	+ 0 28.5	155 35.0	− 3 05.9	304 19.5	118	+21 53.4	+ 95
19	3 41.8	151 55.4	16.9	174 28.1	08.6	359 03.7	28.5	170 37.3	06.0	318 50.3	117	22 02.9	+ 93
20	18 44.2	166 55.1	17.8	189 29.3	09.2	14 06.1	28.6	185 39.5	06.0	333 21.0	116	22 12.2	+ 93
21	33 46.7	181 54.8	·· 18.7	204 30.5	·· 09.7	29 08.4	·· 28.6	200 41.8	·· 06.1	347 51.6	116	·22 21.5	+ 92
22	48 49.1	196 54.5	19.6	219 31.7	10.2	44 10.8	28.6	215 44.1	06.2	2 22.2	115	22 30.7	+ 90
23	63 51.6	211 54.3	20.6	234 32.9	10.8	59 13.2	28.7	230 46.4	06.2	16 52.7	115	22 39.7	+ 89
0	78 54.1	226 54.0	−10 21.5	249 34.1	− 2 11.3	74 15.6	+ 0 28.7	245 48.7	− 3 06.3	31 23.2	114	+22 48.6	+ 89
1	93 56.5	241 53.7	22.4	264 35.3	11.8	89 18.0	28.8	260 51.0	06.3	45 53.6	114	22 57.5	+ 87
2	108 59.0	256 53.5	23.3	279 36.5	12.4	104 20.4	28.8	275 53.3	06.4	60 24.0	113	23 06.2	+ 86
3	124 01.5	271 53.2	·· 24.3	294 37.7	·· 12.9	119 22.7	·· 28.9	290 55.6	·· 06.5	74 54.3	113	·23 14.8	+ 85
4	139 03.9	286 52.9	25.2	309 38.8	13.4	134 25.1	28.9	305 57.9	06.5	89 24.6	112	23 23.3	+ 83
5	154 06.4	301 52.6	26.1	324 40.0	14.0	149 27.5	29.0	321 00.2	06.6	103 54.8	112	23 31.6	+ 83
6	169 08.9	316 52.4	−10 27.0	339 41.2	− 2 14.5	164 29.9	+ 0 29.0	336 02.4	− 3 06.7	118 25.0	111	+23 39.9	+ 81
7	184 11.3	331 52.1	27.9	354 42.4	15.0	179 32.3	29.1	351 04.7	06.7	132 55.1	111	23 48.0	+ 81
8	199 13.8	346 51.8	28.9	9 43.6	15.5	194 34.6	29.1	6 07.0	06.8	147 25.2	110	23 56.1	+ 79
9	214 16.2	1 51.5	·· 29.8	24 44.8	·· 16.1	209 37.0	·· 29.2	21 09.3	·· 06.8	161 55.2	109	·24 04.0	+ 77
10	229 18.7	16 51.3	30.7	39 46.0	16.6	224 39.4	29.2	36 11.6	06.9	176 25.1	110	24 11.7	+ 77
11	244 21.2	31 51.0	31.6	54 47.2	17.1	239 41.8	29.3	51 13.9	07.0	190 55.1	108	24 19.4	+ 75
12	259 23.6	46 50.7	−10 32.5	69 48.4	− 2 17.7	254 44.2	+ 0 29.3	66 16.2	− 3 07.0	205 24.9	108	+24 26.9	+ 75
13	274 26.1	61 50.4	33.5	84 49.6	18.2	269 46.5	29.4	81 18.5	07.1	219 54.7	108	24 34.4	+ 73
14	289 28.6	76 50.1	34.4	99 50.7	18.7	284 48.9	29.4	96 20.8	07.2	234 24.5	107	24 41.7	+ 72
15	304 31.0	91 49.9	·· 35.3	114 51.9	·· 19.2	299 51.3	·· 29.5	111 23.1	·· 07.2	248 54.2	107	·24 48.9	+ 70
16	319 33.5	106 49.6	36.2	129 53.1	19.8	314 53.7	29.5	126 25.4	07.3	263 23.9	107	24 55.9	+ 69
17	334 36.0	121 49.3	37.1	144 54.3	20.3	329 56.1	29.6	141 27.7	07.3	277 53.6	105	25 02.8	+ 69
18	349 38.4	136 49.0	−10 38.1	159 55.5	− 2 20.8	344 58.4	+ 0 29.6	156 29.9	− 3 07.4	292 23.1	106	+25 09.7	+ 66
19	4 40.9	151 48.7	39.0	174 56.7	21.4	0 00.8	29.7	171 32.2	07.5	306 52.7	105	25 16.3	+ 66
20	19 43.4	166 48.4	39.9	189 57.9	21.9	15 03.2	29.7	186 34.5	07.5	321 22.2	104	25 22.9	+ 64
21	34 45.8	181 48.2	·· 40.8	204 59.1	·· 22.4	30 05.6	·· 29.8	201 36.8	·· 07.6	335 51.6	104	·25 29.3	+ 63
22	49 48.3	196 47.9	41.7	220 00.3	22.9	45 07.9	29.8	216 39.1	07.6	350 21.0	104	25 35.6	+ 62
23	64 50.7	211 47.6	42.7	235 01.5	23.5	60 10.3	29.9	231 41.4	07.7	4 50.4	103	25 41.8	+ 61
24	79 53.2	226 47.3	−10 43.6	250 02.7	− 2 24.0	75 12.7	+ 0 29.9	246 43.7	− 3 07.8	19 19.7	103	+25 47.9	+ 59
code	—	− 2	− 9	+ 12	− 6	+ 24	0	+ 23	− 1				

GCT	SUN GHA	SUN Dec.
h	° ′	° ′
0	182 01.6	−22 43.3
1	197 01.3	43.6
2	212 01.0	43.8
3	227 00.7	·· 44.1
4	242 00.5	44.3
5	257 00.2	44.6
6	271 59.9	−22 44.9
7	286 59.6	45.1
8	301 59.4	45.4
9	316 59.1	·· 45.6
10	331 58.8	45.9
11	346 58.5	46.1
12	1 58.2	−22 46.4
13	16 58.0	46.6
14	31 57.7	46.9
15	46 57.4	·· 47.1
16	61 57.1	47.4
17	76 56.9	47.7
18	91 56.6	−22 47.9
19	106 56.3	48.1
20	121 56.0	48.4
21	136 55.8	·· 48.6
22	151 55.5	48.9
23	166 55.2	49.1
0	181 54.9	−22 49.4
1	196 54.6	49.6
2	211 54.4	49.9
3	226 54.1	·· 50.1
4	241 53.8	50.4
5	256 53.5	50.6
6	271 53.2	−22 50.8
7	286 53.0	51.1
8	301 52.7	51.3
9	316 52.4	·· 51.6
10	331 52.1	51.8
11	346 51.8	52.0
12	1 51.6	−22 52.3
13	16 51.3	52.5
14	31 51.0	52.7
15	46 50.7	·· 53.0
16	61 50.4	53.2
17	76 50.2	53.4
18	91 49.9	−22 53.7
19	106 49.6	53.9
20	121 49.3	54.1
21	136 49.0	·· 54.3
22	151 48.7	54.6
23	166 48.5	54.8
0	181 48.2	−22 55.0
1	196 47.9	55.3
2	211 47.6	55.5
3	226 47.3	·· 55.7
4	241 47.0	55.9
5	256 46.8	56.1
6	271 46.5	−22 56.4
7	286 46.2	56.6
8	301 45.9	56.8
9	316 45.6	·· 57.0
10	331 45.3	57.2
11	346 45.1	57.5
12	1 44.8	−22 57.7
13	16 44.5	57.9
14	31 44.2	58.1
15	46 43.9	·· 58.3
16	61 43.6	58.5
17	76 43.3	58.7
18	91 43.1	−22 59.0
19	106 42.8	59.2
20	121 42.5	59.4
21	136 42.2	·· 59.6
22	151 41.9	22 59.8
23	166 41.6	23 00.0
24	181 41.3	−23 00.2
code	—	− 2

STARS No.	SHA	Dec.	Transit Mer. Gr.
	° ′	° ′	h m
1	358 31.4	+28 49.7	18 51
2	358 21.0	+58 53.4	18 52
3	349 42.1	−18 15.0	19 26
4	339 19.9	+59 59.5	20 08
5	336 00.5	−57 28.9	20 21
6	332 21.4	+89 02.7	20 36
7	328 52.8	+23 14.4	20 49
8	315 52.9	−40 29.8	21 41
9	309 46.3	+49 41.8	22 06
10	291 42.2	+16 25.0	23 18
11	281 56.2	− 8 15.2	0 01
12	281 42.4	+45 57.2	0 02
13	279 21.3	+ 6 18.6	0 11
14	279 10.7	+28 34.3	0 12
15	276 33.0	− 1 13.7	0 22
16	271 51.0	+ 7 24.1	0 41
17	264 16.2	−52 39.9	1 11
18	259 14.1	−16 38.7	1 31
19	255 48.5	−28 54.1	1 45
20	245 47.8	+ 5 21.1	2 25
21	244 23.9	+28 08.7	2 30
22	234 36.7	−59 20.9	3 09
23	223 26.4	−43 14.0	3 54
24	221 49.5	−69 30.8	4 00
25	218 41.4	− 8 26.8	4 13
26	208 32.6	+12 12.2	4 53
27	194 47.9	+62 00.4	5 48
28	183 20.8	+14 50.4	6 34
29	174 01.7	−62 49.7	7 11
30	172 53.0	−56 50.4	7 16
31	168 46.9	−59 25.4	7 32
32	167 01.2	+56 12.9	7 39
33	159 30.2	+55 10.2	8 09
34	159 20.2	−10 54.7	8 10
35	153 35.4	+49 32.9	8 33
36	149 02.6	−36 08.0	8 51
37	146 38.1	+19 25.8	9 00
38	140 55.8	−60 38.3	9 23
39	137 18.4	+74 20.8	9 38
40	126 50.5	+26 52.4	10 19
41	120 38.0	−22 29.3	10 44
42	113 23.4	−26 19.7	11 13
43	109 07.5	−68 56.6	11 30
44	103 06.0	−15 40.1	11 54
45	97 25.2	−37 04.4	12 17
46	96 49.7	+12 35.5	12 19
47	91 08.2	+51 29.6	12 42
48	84 45.5	−34 24.7	13 07
49	81 10.7	+38 44.2	13 21
50	76 55.9	−26 21.6	13 38
51	62 53.6	+ 8 44.4	14 34
52	54 32.3	−56 53.7	15 08
53	50 03.4	+45 06.6	15 26
54	34 32.7	+ 9 39.3	16 27
55	28 41.7	−47 11.9	16 51
56	16 14.9	−29 52.8	17 40
57	14 24.5	+14 56.9	17 48

Lat.	Sunrise	Twlt. begins	Moonrise 9	10	11	12
N °	h m	h m	h m	h m	h m	h m
70	■	6 32	11 14	□	□	□
68	■	6 25	11 41	10 54	□	□
66	10 14	6 19	12 02	11 37	□	□
64	9 36	6 14	12 19	12 06	11 46	□
62	9 10	6 09	12 33	12 29	12 25	12 22
60	8 50	6 05	12 44	12 47	12 52	13 05
58	8 33	6 01	12 55	13 02	13 14	13 34
56	8 19	5 58	13 04	13 15	13 31	13 57
54	8 07	5 54	13 12	13 26	13 46	14 15
52	7 56	5 50	13 19	13 36	13 59	14 31
50	7 47	5 48	13 26	13 45	14 10	14 44
45	7 27	5 40	13 40	14 04	14 34	15 12
40	7 10	5 32	13 51	14 20	14 54	15 34
35	6 57	5 26	14 01	14 33	15 10	15 52
30	6 45	5 19	14 10	14 45	15 24	16 08
20	6 24	5 05	14 26	15 05	15 48	16 34
10	6 06	4 50	14 39	15 22	16 08	16 57
0	5 49	4 33	14 52	15 39	16 28	17 19
10	5 32	4 14	15 04	15 55	16 47	17 41
20	5 13	3 49	15 18	16 13	17 08	18 04
30	4 52	3 16	15 34	16 34	17 33	18 31
35	4 39	2 53	15 43	16 46	17 47	18 47
40	4 24	2 23	15 54	17 00	18 04	19 05
45	4 07	1 38	16 06	17 16	18 24	19 28
50	3 45	////	16 22	17 37	18 50	19 57
52	3 35	////	16 29	17 47	19 02	20 11
54	3 23	////	16 37	17 58	19 16	20 28
56	3 09	////	16 46	18 11	19 33	20 48
58	2 53	////	16 56	18 25	19 53	21 13
60	2 34	////	17 08	18 43	20 18	21 46
S						

Lat.	Sunset	Twlt. ends	Moonset 9	10	11	12
N °	h m	h m	h m	h m	h m	h m
70	■	17 11	5 43	□	□	□
68	■	17 18	5 18	7 41	□	□
66	13 31	17 24	4 58	7 00	□	□
64	14 08	17 29	4 43	6 32	8 33	□
62	14 35	17 35	4 30	6 10	7 55	9 44
60	14 55	17 39	4 19	5 53	7 28	9 00
58	15 12	17 43	4 10	5 39	7 07	8 32
56	15 26	17 47	4 02	5 26	6 50	8 09
54	15 38	17 50	3 55	5 16	6 36	7 51
52	15 49	17 54	3 48	5 06	6 23	7 36
50	15 58	17 57	3 42	4 58	6 12	7 23
45	16 18	18 04	3 30	4 40	5 49	6 55
40	16 35	18 12	3 20	4 25	5 31	6 34
35	16 49	18 19	3 11	4 13	5 15	6 16
30	17 01	18 26	3 03	4 03	5 02	6 01
20	17 21	18 39	2 50	3 44	4 40	5 35
10	17 39	18 54	2 39	3 29	4 20	5 13
0	17 56	19 11	2 28	3 14	4 02	4 52
10	18 13	19 30	2 17	2 59	3 44	4 32
20	18 32	19 56	2 06	2 44	3 25	4 10
30	18 53	20 29	1 53	2 26	3 03	3 44
35	19 06	20 52	1 46	2 16	2 50	3 29
40	19 21	21 23	1 37	2 04	2 35	3 12
45	19 38	22 08	1 27	1 50	2 17	2 51
50	20 00	////	1 16	1 33	1 55	2 25
52	20 11	////	1 10	1 25	1 45	2 12
54	20 22	////	1 04	1 17	1 33	1 57
56	20 36	////	0 58	1 07	1 20	1 40
58	20 52	////	0 50	0 56	1 05	1 20
60	21 12	////	0 42	0 43	0 46	0 54
S						

GCT	Equation of Time (App.—Mean) 9	10	11
h	m s	m s	m s
0	+ 8 06.8	+ 7 40.2	+ 7 13.3
6	+ 8 00.2	+ 7 33.5	+ 7 06.5
12	+ 7 53.6	+ 7 26.8	+ 6 59.6
18	+ 7 46.9	+ 7 20.1	+ 6 52.8
24	+ 7 40.2	+ 7 13.3	+ 6 45.9

GCT of Transit Meridian of Greenwich

DAY	Moon	Venus	Mars	Jupiter	Saturn
	h m	h m	h m	h m	h m
9	21 03	8 52	7 25	19 08	7 43
10	21 50	8 52	7 23	19 04	7 39
11	22 40	8 53	7 21	19 00	7 36
12	23 31	8 53	7 19	18 56	7 32

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb	Venus	Mars
°	′	′	′
0			
	0.6	0.2	0.1
30			
	0.6	0.1	0.1
45			
	0.6	0.1	0.1
60			
	0.6	0.1	0.0
75			
	0.6	0.0	0.0
90			

Moon's Lower Limb
Add

Alt.	9	10	11
°	′	′	′
0			
	14.0	13.4	12.9
4			
	14.0	13.4	12.9
8			
	14.0	13.4	12.9
12			
	14.1	13.4	12.9
16			
	14.1	13.5	13.0
20			
	14.1	13.5	13.0
24			
	14.1	13.6	13.1
28			
	14.2	13.6	13.2
32			
	14.2	13.7	13.2
36			
	14.3	13.7	13.3
40			
	14.3	13.8	13.4
44			
	14.4	13.9	13.5
48			
	14.5	14.0	13.6
52			
	14.5	14.1	13.7
56			
	14.6	14.2	13.9
60			
	14.7	14.3	14.0
64			
	14.7	14.4	14.1
68			
	14.8	14.5	14.3
72			
	14.9	14.6	14.4
76			
	15.0	14.7	14.5
80			
	15.1	14.9	14.7
84			
	15.1	15.0	14.8
88			
	15.2	15.1	14.9
90			

Add to table, back cover

Moon's Upper Limb
Subtract

Alt.	9	10	11
°	′	′	′
0			
	16.4	16.8	17.1
4			
	16.4	16.8	17.1
8			
	16.4	16.8	17.0
12			
	16.4	16.7	17.0
16			
	16.4	16.7	17.0
20			
	16.3	16.7	16.9
24			
	16.3	16.6	16.9
28			
	16.3	16.6	16.8
32			
	16.2	16.5	16.7
36			
	16.2	16.4	16.6
40			
	16.1	16.4	16.5
44			
	16.1	16.3	16.4
48			
	16.0	16.2	16.3
52			
	15.9	16.1	16.2
56			
	15.9	16.0	16.1
60			
	15.8	15.9	16.0
64			
	15.7	15.8	15.8
68			
	15.6	15.7	15.7
72			
	15.6	15.6	15.6
76			
	15.5	15.4	15.4
80			
	15.4	15.3	15.3
84			
	15.3	15.2	15.1
88			
	15.2	15.1	15.0
90			

Subtract from table, back cover

G C T	♈	VENUS − 3.8		MARS 1.5		JUPITER − 2.1		SATURN 1.0		MOON			
	GHA	GHA	Dec.	GHA	Dec.	GHA	Dec.	GHA	Dec.	GHA	code	Dec.	code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
0	79 53.2	226 47.3	−10 43.6	250 02.7	− 2 24.0	75 12.7	+ 0 29.9	246 43.7	− 3 07.8	19 19.7	103	+25 47.9	+ 59
1	94 55.7	241 47.0	44.5	265 03.9	24.5	90 15.1	30.0	261 46.0	07.8	33 49.0	103	25 53.8	+ 58
2	109 58.1	256 46.7	45.4	280 05.1	25.1	105 17.4	30.0	276 48.3	07.9	48 18.3	102	25 59.6	+ 57
3	125 00.6	271 46.5	·· 46.3	295 06.2	·· 25.6	120 19.8	·· 30.1	291 50.6	·· 07.9	62 47.5	101	·26 05.3	+ 55
4	140 03.1	286 46.2	47.3	310 07.4	26.1	135 22.2	30.2	306 52.9	08.0	77 16.6	102	26 10.8	+ 54
5	155 05.5	301 45.9	48.2	325 08.6	26.6	150 24.6	30.2	321 55.2	08.1	91 45.8	101	26 16.2	+ 53
6	170 08.0	316 45.6	−10 49.1	340 09.8	− 2 27.2	165 26.9	+ 0 30.3	336 57.5	− 3 08.1	106 14.9	100	+26 21.5	+ 51
7	185 10.5	331 45.3	50.0	355 11.0	27.7	180 29.3	30.3	351 59.8	08.2	120 43.9	101	26 26.6	+ 50
8	200 12.9	346 45.0	50.9	10 12.2	28.2	195 31.7	30.4	7 02.0	08.3	135 13.0	100	26 31.6	+ 49
9	215 15.4	1 44.7	·· 51.8	25 13.4	·· 28.7	210 34.1	·· 30.4	22 04.3	·· 08.3	149 42.0	99	·26 36.5	+ 47
10	230 17.9	16 44.4	52.8	40 14.6	29.3	225 36.4	30.5	37 06.6	08.4	164 10.9	99	26 41.2	+ 46
11	245 20.3	31 44.1	53.7	55 15.8	29.8	240 38.8	30.5	52 08.9	08.4	178 39.8	99	26 45.8	+ 45
·12	260 22.8	46 43.9	−10 54.6	70 17.0	− 2 30.3	255 41.2	+ 0 30.6	67 11.2	− 3 08.5	193 08.7	99	+26 50.3	+ 43
13	275 25.2	61 43.6	55.5	85 18.2	30.9	270 43.6	30.6	82 13.5	08.6	207 37.6	99	26 54.6	+ 43
14	290 27.7	76 43.3	56.4	100 19.4	31.4	285 45.9	30.7	97 15.8	08.6	222 06.5	98	26 58.9	+ 40
15	305 30.2	91 43.0	·· 57.3	115 20.6	·· 31.9	300 48.3	·· 30.7	112 18.1	·· 08.7	236 35.3	98	·27 02.9	+ 40
16	320 32.6	106 42.7	58.2	130 21.8	32.4	315 50.7	30.8	127 20.4	08.7	251 04.1	97	27 06.9	+ 38
17	335 35.1	121 42.4	10 59.2	145 23.0	33.0	330 53.0	30.8	142 22.7	08.8	265 32.8	98	27 10.7	+ 36
18	350 37.6	136 42.1	−11 00.1	160 24.2	− 2 33.5	345 55.4	+ 0 30.9	157 25.0	− 3 08.9	280 01.6	97	+27 14.3	+ 35
19	5 40.0	151 41.8	01.0	175 25.3	34.0	0 57.8	31.0	172 27.3	08.9	294 30.3	97	27 17.8	+ 34
20	20 42.5	166 41.5	01.9	190 26.5	34.5	16 00.1	31.0	187 29.6	09.0	308 59.0	97	27 21.2	+ 33
21	35 45.0	181 41.2	·· 02.8	205 27.7	·· 35.1	31 02.5	·· 31.1	202 31.9	·· 09.0	323 27.7	96	·27 24.5	+ 31
22	50 47.4	196 40.9	03.7	220 28.9	35.6	46 04.9	31.1	217 34.2	09.1	337 56.3	97	27 27.6	+ 30
23	65 49.9	211 40.6	04.6	235 30.1	36.1	61 07.3	31.2	232 36.5	09.2	352 25.0	96	27 30.6	+ 28
0	80 52.4	226 40.3	−11 05.6	250 31.3	− 2 36.6	76 09.6	+ 0 31.2	247 38.8	− 3 09.2	6 53.6	96	+27 33.4	+ 27
1	95 54.8	241 40.0	06.5	265 32.5	37.2	91 12.0	31.3	262 41.1	09.3	21 22.2	96	27 36.1	+ 26
2	110 57.3	256 39.7	07.4	280 33.7	37.7	106 14.4	31.3	277 43.4	09.3	35 50.8	96	27 38.7	+ 24
3	125 59.7	271 39.4	·· 08.3	295 34.9	·· 38.2	121 16.7	·· 31.4	292 45.7	·· 09.4	50 19.4	96	·27 41.1	+ 23
4	141 02.2	286 39.1	09.2	310 36.1	38.7	136 19.1	31.4	307 48.0	09.5	64 48.0	95	27 43.4	+ 21
5	156 04.7	301 38.8	10.1	325 37.3	39.3	151 21.5	31.5	322 50.3	09.5	79 16.5	96	27 45.5	+ 20
6	171 07.1	316 38.5	−11 11.0	340 38.5	− 2 39.8	166 23.8	+ 0 31.6	337 52.5	− 3 09.6	93 45.1	95	+27 47.5	+ 19
7	186 09.6	331 38.2	12.0	355 39.7	40.3	181 26.2	31.6	352 54.8	09.6	108 13.6	96	27 49.4	+ 17
8	201 12.1	346 37.9	12.9	10 40.9	40.8	196 28.6	31.7	7 57.1	09.7	122 42.2	95	27 51.1	+ 16
9	216 14.5	1 37.6	·· 13.8	25 42.1	·· 41.4	211 30.9	·· 31.7	22 59.4	·· 09.8	137 10.7	95	·27 52.7	+ 15
10	231 17.0	16 37.3	14.7	40 43.3	41.9	226 33.3	31.8	38 01.7	09.8	151 39.2	96	27 54.2	+ 13
11	246 19.5	31 37.0	15.6	55 44.5	42.4	241 35.6	31.8	53 04.0	09.9	166 07.8	95	27 55.5	+ 11
12	261 21.9	46 36.7	−11 16.5	70 45.7	− 2 42.9	256 38.0	+ 0 31.9	68 06.3	− 3 09.9	180 36.3	95	+27 56.6	+ 11
13	276 24.4	61 36.4	17.4	85 46.9	43.5	271 40.4	31.9	83 08.6	10.0	195 04.8	96	27 57.7	+ 8
14	291 26.9	76 36.1	18.3	100 48.1	44.0	286 42.7	32.0	98 10.9	10.0	209 33.4	95	27 58.5	+ 8
15	306 29.3	91 35.8	·· 19.2	115 49.3	·· 44.5	301 45.1	·· 32.1	113 13.2	·· 10.1	224 01.9	95	·27 59.3	+ 6
16	321 31.8	106 35.5	20.2	130 50.5	45.0	316 47.5	32.1	128 15.5	10.2	238 30.4	96	27 59.9	+ 5
17	336 34.2	121 35.2	21.1	145 51.7	45.6	331 49.8	32.2	143 17.8	10.2	252 59.0	96	28 00.4	+ 3
18	351 36.7	136 34.9	−11 22.0	160 52.9	− 2 46.1	346 52.2	+ 0 32.2	158 20.1	− 3 10.3	267 27.6	95	+28 00.7	+ 2
19	6 39.2	151 34.5	22.9	175 54.1	46.6	1 54.6	32.3	173 22.4	10.3	281 56.1	96	28 00.9	+ 1
20	21 41.6	166 34.2	23.8	190 55.3	47.1	16 56.9	32.3	188 24.7	10.4	296 24.7	96	28 01.0	− 1
21	36 44.1	181 33.9	·· 24.7	205 56.5	·· 47.7	31 59.3	·· 32.4	203 27.0	·· 10.5	310 53.3	96	·28 00.9	− 2
22	51 46.6	196 33.6	25.6	220 57.6	48.2	47 01.6	32.5	218 29.3	10.5	325 21.9	96	28 00.7	− 4
23	66 49.0	211 33.3	26.5	235 58.8	48.7	62 04.0	32.5	233 31.6	10.6	339 50.5	96	28 00.3	− 5
0	81 51.5	226 33.0	−11 27.4	251 00.0	− 2 49.2	77 06.4	+ 0 32.6	248 33.9	− 3 10.6	354 19.1	97	+27 59.8	− 6
1	96 54.0	241 32.7	28.3	266 01.2	49.8	92 08.7	32.6	263 36.2	10.7	8 47.8	96	27 59.2	− 8
2	111 56.4	256 32.4	29.2	281 02.4	50.3	107 11.1	32.7	278 38.5	10.7	23 16.4	97	27 58.4	− 9
3	126 58.9	271 32.1	·· 30.1	296 03.6	·· 50.8	122 13.4	·· 32.8	293 40.8	·· 10.8	37 45.1	97	·27 57.5	− 11
4	142 01.3	286 31.7	31.1	311 04.8	51.3	137 15.8	32.8	308 43.1	10.9	52 13.8	97	27 56.4	− 12
5	157 03.8	301 31.4	32.0	326 06.0	51.8	152 18.2	32.9	323 45.4	10.9	66 42.5	98	27 55.2	− 13
6	172 06.3	316 31.1	−11 32.9	341 07.2	− 2 52.4	167 20.5	+ 0 32.9	338 47.7	− 3 11.0	81 11.3	98	+27 53.9	− 15
7	187 08.7	331 30.8	33.8	356 08.4	52.9	182 22.9	33.0	353 50.0	11.0	95 40.1	97	27 52.4	− 16
8	202 11.2	346 30.5	34.7	11 09.6	53.4	197 25.2	33.1	8 52.3	11.1	110 08.8	99	27 50.8	− 17
9	217 13.7	1 30.2	·· 35.6	26 10.8	·· 53.9	212 27.6	·· 33.1	23 54.6	·· 11.2	124 37.7	98	·27 49.1	− 19
10	232 16.1	16 29.9	36.5	41 12.0	54.5	227 29.9	33.2	38 56.9	11.2	139 06.5	99	27 47.2	− 20
11	247 18.6	31 29.5	37.4	56 13.2	55.0	242 32.3	33.2	53 59.2	11.3	153 35.4	99	27 45.2	− 21
12	262 21.1	46 29.2	−11 38.3	71 14.4	− 2 55.5	257 34.7	+ 0 33.3	69 01.5	− 3 11.3	168 04.3	100	+27 43.1	− 23
13	277 23.5	61 28.9	39.2	86 15.6	56.0	272 37.0	33.3	84 03.8	11.4	182 33.3	100	27 40.8	− 24
14	292 26.0	76 28.6	40.1	101 16.8	56.5	287 39.4	33.4	99 06.1	11.4	197 02.3	100	27 38.4	− 25
15	307 28.5	91 28.3	·· 41.0	116 18.0	·· 57.1	302 41.7	·· 33.5	114 08.4	·· 11.5	211 31.3	100	·27 35.9	− 27
16	322 30.9	106 27.9	41.9	131 19.2	57.6	317 44.1	33.5	129 10.7	11.6	226 00.3	101	27 33.2	− 28
17	337 33.4	121 27.6	42.8	146 20.4	58.1	332 46.4	33.6	144 13.0	11.6	240 29.4	101	27 30.4	− 30
18	352 35.8	136 27.3	−11 43.7	161 21.6	− 2 58.6	347 48.8	+ 0 33.6	159 15.3	− 3 11.7	254 58.5	102	+27 27.4	− 31
19	7 38.3	151 27.0	44.6	176 22.8	59.2	2 51.1	33.7	174 17.6	11.7	269 27.7	102	27 24.3	− 32
20	22 40.8	166 26.7	45.5	191 24.0	2 59.7	17 53.5	33.8	189 19.9	11.8	283 56.9	102	27 21.1	− 33
21	37 43.2	181 26.3	·· 46.4	206 25.2	· 3 00.2	32 55.9	·· 33.8	204 22.2	·· 11.8	298 26.1	103	·27 17.8	− 35
22	52 45.7	196 26.0	47.4	221 26.4	00.7	47 58.2	33.9	219 24.5	11.9	312 55.4	103	27 14.3	− 36
23	67 48.2	211 25.7	48.3	236 27.6	01.2	63 00.6	34.0	234 26.8	12.0	327 24.7	104	27 10.7	− 37
24	82 50.6	226 25.4	−11 49.2	251 28.8	− 3 01.8	78 02.9	+ 0 34.0	249 29.1	− 3 12.0	341 54.1	104	+27 07.0	− 38
code	—	− 3	− 9	+ 12	− 6	+ 24	0	+ 23	− 1				

GCT	SUN GHA	SUN Dec.
h	° ′	° ′
0	181 41.3	−23 00.2
1	196 41.1	00.4
2	211 40.8	00.6
3	226 40.5	·· 00.8
4	241 40.2	01.0
5	256 39.9	01.2
6	271 39.6	−23 01.4
7	286 39.3	01.6
8	301 39.0	01.8
9	316 38.7	·· 02.0
10	331 38.5	02.2
11	346 38.2	02.4
12	1 37.9	−23 02.6
13	16 37.6	02.8
14	31 37.3	03.0
15	46 37.0	·· 03.2
16	61 36.7	03.4
17	76 36.4	03.6
18	91 36.1	−23 03.8
19	106 35.9	04.0
20	121 35.6	04.2
21	136 35.3	·· 04.4
22	151 35.0	04.6
23	166 34.7	04.8
0	181 34.4	−23 05.0
1	196 34.1	05.1
2	211 33.8	05.3
3	226 33.5	·· 05.5
4	241 33.2	05.7
5	256 32.9	05.9
6	271 32.7	−23 06.1
7	286 32.4	06.2
8	301 32.1	06.4
9	316 31.8	·· 06.6
10	331 31.5	06.8
11	346 31.2	07.0
12	1 30.9	−23 07.1
13	16 30.6	07.3
14	31 30.3	07.5
15	46 30.0	·· 07.7
16	61 29.7	07.9
17	76 29.4	08.0
18	91 29.1	−23 08.2
19	106 28.8	08.4
20	121 28.6	08.5
21	136 28.3	·· 08.7
22	151 28.0	08.9
23	166 27.7	09.1
0	181 27.4	−23 09.2
1	196 27.1	09.4
2	211 26.8	09.6
3	226 26.5	·· 09.7
4	241 26.2	09.9
5	256 25.9	10.1
6	271 25.6	−23 10.2
7	286 25.3	10.4
8	301 25.0	10.6
9	316 24.7	·· 10.7
10	331 24.4	10.9
11	346 24.1	11.0
12	1 23.8	−23 11.2
13	16 23.5	11.4
14	31 23.2	11.5
15	46 22.9	·· 11.7
16	61 22.7	11.8
17	76 22.4	12.0
18	91 22.1	−23 12.1
19	106 21.8	12.3
20	121 21.5	12.4
21	136 21.2	·· 12.6
22	151 20.9	12.7
23	166 20.6	12.9
24	181 20.3	−23 13.0
code	—	− 2

STARS No.	SHA	Dec.	Transit Mer. Gr.
	° ′	° ′	h m
1	358 31.4	+28 49.7	18 39
2	358 21.0	+58 53.4	18 40
3	349 42.1	−18 15.0	19 15
4	339 19.9	+59 59.5	19 56
5	336 00.5	−57 29.0	20 09
6	332 22.0	+89 02.7	20 24
7	328 52.8	+23 14.4	20 38
8	315 52.9	−40 29.8	21 29
9	309 46.3	+49 41.8	21 54
10	291 42.1	+16 25.0	23 06
11	281 56.1	− 8 15.2	23 45
12	281 42.4	+45 57.2	23 46
13	279 21.3	+ 6 18.6	23 55
14	279 10.7	+28 34.3	23 56
15	276 33.0	− 1 13.7	0 10
16	271 51.0	+ 7 24.1	0 29
17	264 16.2	−52 39.9	0 59
18	259 14.1	−16 38.7	1 19
19	255 48.5	−28 54.1	1 33
20	245 47.8	+ 5 21.1	2 13
21	244 23.9	+28 08.7	2 19
22	234 36.7	−59 21.0	2 58
23	223 26.4	−43 14.0	3 42
24	221 49.5	−69 30.8	3 49
25	218 41.4	− 8 26.9	4 01
26	208 32.5	+12 12.1	4 42
27	194 47.9	+62 00.3	5 36
28	183 20.8	+14 50.3	6 22
29	174 01.6	−62 49.7	6 59
30	172 53.0	−56 50.4	7 04
31	168 46.9	−59 25.4	7 20
32	167 01.1	+56 12.9	7 27
33	159 30.1	+55 10.2	7 57
34	159 20.2	−10 54.7	7 58
35	153 35.4	+49 32.9	8 21
36	149 02.5	−36 08.0	8 39
37	146 38.1	+19 25.7	8 49
38	140 55.8	−60 38.3	9 11
39	137 18.3	+74 20.8	9 26
40	126 50.4	+26 52.3	10 07
41	120 37.9	−22 29.3	10 32
42	113 23.4	−26 19.7	11 01
43	109 07.5	−68 56.6	11 18
44	103 06.0	−15 40.1	11 42
45	97 25.2	−37 04.4	12 05
46	96 49.7	+12 35.5	12 07
47	91 08.2	+51 29.6	12 30
48	84 45.5	−34 24.7	12 55
49	81 10.7	+38 44.2	13 10
50	76 55.9	−26 21.6	13 27
51	62 53.6	+ 8 44.4	14 23
52	54 32.3	−56 53.7	14 56
53	50 03.4	+45 06.6	15 14
54	34 32.7	+ 9 39.3	16 16
55	28 41.7	−47 11.9	16 39
56	16 14.9	−29 52.8	17 29
57	14 24.5	+14 56.9	17 36

Lat.	Sunrise	Twlt. begins	Moonrise 12	13	14	15
N °	h m	h m	h m	h m	h m	h m
70	■	6 36	□	□	□	□
68	■	6 29	□	□	□	□
66	10 22	6 23	□	□	□	□
64	9 42	6 17	□	□	□	13 57
62	9 15	6 13	12 22	12 23	13 35	15 22
60	8 54	6 09	13 05	13 35	14 35	15 58
58	8 37	6 04	13 34	14 11	15 09	16 24
56	8 23	6 01	13 57	14 36	15 33	16 44
54	8 10	5 56	14 15	14 57	15 53	17 01
52	7 59	5 53	14 31	15 14	16 10	17 16
50	7 50	5 50	14 44	15 29	16 24	17 28
45	7 29	5 42	15 12	15 58	16 53	17 54
40	7 13	5 35	15 34	16 21	17 16	18 15
35	6 59	5 28	15 52	16 41	17 34	18 32
30	6 47	5 21	16 08	16 57	17 51	18 46
20	6 26	5 07	16 34	17 25	18 18	19 11
10	6 07	4 52	16 57	17 49	18 41	19 33
0	5 50	4 35	17 19	18 11	19 03	19 53
10	5 33	4 15	17 41	18 33	19 24	20 13
20	5 14	3 50	18 04	18 57	19 48	20 34
30	4 52	3 16	18 31	19 25	20 15	20 58
35	4 40	2 53	18 47	19 42	20 31	21 13
40	4 25	2 23	19 05	20 01	20 49	21 29
45	4 07	1 36	19 28	20 25	21 12	21 49
50	3 45	////	19 57	20 54	21 40	22 14
52	3 34	////	20 11	21 09	21 54	22 26
54	3 22	////	20 28	21 27	22 10	22 40
56	3 08	////	20 48	21 48	22 29	22 56
58	2 52	////	21 13	22 14	22 53	23 14
60	2 32	////	21 46	22 51	23 24	23 37
S						

Lat.	Sunset	Twlt. ends	Moonset 12	13	14	15
N °	h m	h m	h m	h m	h m	h m
70	■	17 10	□	□	□	□
68	■	17 17	□	□	□	□
66	13 26	17 23	□	□	□	□
64	14 06	17 29	□	□	□	13 31
62	14 33	17 34	9 44	11 30	12 07	12 06
60	14 54	17 39	9 00	10 18	11 07	11 29
58	15 11	17 43	8 32	9 43	10 33	11 02
56	15 25	17 46	8 09	9 17	10 08	10 42
54	15 37	17 50	7 51	8 57	9 48	10 24
52	15 48	17 53	7 36	8 40	9 32	10 10
50	15 58	17 57	7 23	8 25	9 17	9 57
45	16 19	18 06	6 55	7 56	8 48	9 30
40	16 35	18 12	6 34	7 33	8 25	9 09
35	16 49	18 19	6 16	7 14	8 06	8 51
30	17 01	18 26	6 01	6 58	7 50	8 36
20	17 22	18 40	5 35	6 30	7 22	8 10
10	17 41	18 56	5 13	6 06	6 58	7 48
0	17 58	19 13	4 52	5 44	6 36	7 27
10	18 15	19 32	4 32	5 22	6 14	7 06
20	18 34	19 58	4 10	4 58	5 50	6 43
30	18 55	20 31	3 44	4 31	5 22	6 17
35	19 08	20 54	3 29	4 14	5 06	6 02
40	19 23	21 25	3 12	3 55	4 47	5 44
45	19 41	22 12	2 51	3 32	4 23	5 22
50	20 03	////	2 25	3 03	3 53	4 54
52	20 14	////	2 12	2 49	3 38	4 40
54	20 26	////	1 57	2 32	3 21	4 24
56	20 40	////	1 40	2 12	3 00	4 05
58	20 56	////	1 20	1 47	2 34	3 42
60	21 16	////	0 54	1 13	1 57	3 11
S						

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb	Venus	Mars
°	′	′	′
0			
	0.6	0.2	0.1
30			
	0.6	0.1	0.1
45			
	0.6	0.1	0.1
60			
	0.6	0.1	0.0
75			
	0.6	0.0	0.0
90			

Moon's Lower Limb
Add

Alt.	12	13	14
°	′	′	′
0			
	12.5	12.1	11.9
4			
	12.5	12.1	11.9
8			
	12.5	12.2	11.9
12			
	12.6	12.2	11.9
16			
	12.6	12.2	12.0
20			
	12.7	12.3	12.1
24			
	12.7	12.4	12.2
28			
	12.8	12.5	12.2
32			
	12.9	12.6	12.4
36			
	13.0	12.7	12.5
40			
	13.1	12.8	12.6
44			
	13.2	12.9	12.7
48			
	13.4	13.1	12.9
52			
	13.5	13.2	13.1
56			
	13.6	13.4	13.2
60			
	13.8	13.5	13.4
64			
	13.9	13.7	13.6
68			
	14.1	13.9	13.8
72			
	14.2	14.1	14.0
76			
	14.4	14.3	14.2
80			
	14.6	14.4	14.4
84			
	14.7	14.6	14.6
88			
	14.9	14.8	14.7
90			

Add to table, back cover

Moon's Upper Limb
Subtract

Alt.	12	13	14
°	′	′	′
0			
	17.3	17.5	17.7
4			
	17.3	17.5	17.6
8			
	17.3	17.5	17.6
12			
	17.2	17.4	17.6
16			
	17.2	17.4	17.5
20			
	17.1	17.3	17.5
24			
	17.1	17.2	17.4
28			
	17.0	17.2	17.3
32			
	16.9	17.1	17.2
36			
	16.8	16.9	17.0
40			
	16.7	16.8	16.9
44			
	16.6	16.7	16.8
48			
	16.4	16.6	16.6
52			
	16.3	16.4	16.5
56			
	16.2	16.2	16.3
60			
	16.0	16.1	16.1
64			
	15.9	15.9	15.9
68			
	15.7	15.7	15.8
72			
	15.6	15.6	15.6
76			
	15.4	15.4	15.4
80			
	15.2	15.2	15.2
84			
	15.1	15.0	15.0
88			
	14.9	14.9	14.8
90			

Subtract from table, back cover

GCT	Equation of Time (App.—Mean) 12	13	14
h	m s	m s	m s
0	+ 6 45.9	+ 6 18.2	+ 5 50.1
6	+ 6 39.0	+ 6 11.2	+ 5 43.0
12	+ 6 32.1	+ 6 04.2	+ 5 35.9
18	+ 6 25.2	+ 5 57.2	+ 5 28.8
24	+ 6 18.2	+ 5 50.1	+ 5 21.7

GCT of Transit Meridian of Greenwich

DAY	Moon	Venus	Mars	Jupiter	Saturn
	h m	h m	h m	h m	h m
12	23 31	8 53	7 19	18 56	7 32
13	24 24	8 54	7 17	18 52	7 28
14	0 24	8 54	7 15	18 49	7 25
15	1 15	8 55	7 14	18 45	7 21

Full Moon 13

GCT	♈ GHA	VENUS −3.8 GHA	VENUS Dec.	MARS 1.5 GHA	MARS Dec.	JUPITER −2.1 GHA	JUPITER Dec.	SATURN 1.0 GHA	SATURN Dec.	MOON GHA	code	Dec.	code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
0	82 50.6	226 25.4	−11 49.2	251 28.8	− 3 01.8	78 02.9	+ 0 34.0	249 29.1	− 3 12.0	341 54.1	104	+27 07.0	− 38
1	97 53.1	241 25.0	50.1	266 30.0	02.3	93 05.3	34.1	264 31.4	12.1	356 23.5	105	27 03.2	− 40
2	112 55.6	256 24.7	51.0	281 31.2	02.8	108 07.6	34.1	279 33.7	12.1	10 53.0	105	26 59.2	− 41
3	127 58.0	271 24.4	·· 51.9	296 32.4	·· 03.3	123 10.0	·· 34.2	294 36.0	·· 12.2	25 22.5	106	·26 55.1	− 43
4	143 00.5	286 24.1	52.8	311 33.6	03.8	138 12.3	34.3	309 38.3	12.2	39 52.1	106	26 50.8	− 43
5	158 03.0	301 23.7	53.7	326 34.9	04.4	153 14.7	34.3	324 40.7	12.3	54 21.7	106	26 46.5	− 45
6	173 05.4	316 23.4	−11 54.6	341 36.1	− 3 04.9	168 17.0	+ 0 34.4	339 43.0	− 3 12.3	68 51.3	107	+26 42.0	− 46
7	188 07.9	331 23.1	55.5	356 37.3	05.4	183 19.4	34.4	354 45.3	12.4	83 21.0	108	26 37.4	− 48
8	203 10.3	346 22.8	56.4	11 38.5	05.9	198 21.7	34.5	9 47.6	12.5	97 50.8	108	26 32.6	− 48
9	218 12.8	1 22.4	·· 57.3	26 39.7	·· 06.4	213 24.1	·· 34.6	24 49.9	·· 12.5	112 20.6	108	·26 27.8	− 50
10	233 15.3	16 22.1	58.2	41 40.9	07.0	228 26.4	34.6	39 52.2	12.6	126 50.4	109	26 22.8	− 51
11	248 17.7	31 21.8	11 59.1	56 42.1	07.5	243 28.8	34.7	54 54.5	12.6	141 20.3	110	26 17.7	− 52
12	263 20.2	46 21.4	−12 00.0	71 43.3	− 3 08.0	258 31.1	+ 0 34.8	69 56.8	− 3 12.7	155 50.3	110	+26 12.5	− 54
13	278 22.7	61 21.1	00.9	86 44.5	08.5	273 33.5	34.8	84 59.1	12.7	170 20.3	111	26 07.1	− 55
14	293 25.1	76 20.8	01.8	101 45.7	09.0	288 35.8	34.9	100 01.4	12.8	184 50.4	111	26 01.6	− 56
15	308 27.6	91 20.4	·· 02.7	116 46.9	·· 09.6	303 38.2	·· 35.0	115 03.7	·· 12.9	199 20.5	112	·25 56.0	− 57
16	323 30.1	106 20.1	03.6	131 48.1	10.1	318 40.5	35.0	130 06.0	12.9	213 50.7	113	25 50.3	− 58
17	338 32.5	121 19.8	04.5	146 49.3	10.6	333 42.9	35.1	145 08.3	13.0	228 21.0	113	25 44.5	− 59
18	353 35.0	136 19.4	−12 05.4	161 50.5	− 3 11.1	348 45.2	+ 0 35.1	160 10.6	− 3 13.0	242 51.3	113	+25 38.6	− 61
19	8 37.5	151 19.1	06.3	176 51.7	11.6	3 47.6	35.2	175 12.9	13.1	257 21.6	115	25 32.5	− 62
20	23 39.9	166 18.8	07.2	191 52.9	12.2	18 49.9	35.3	190 15.2	13.1	271 52.1	114	25 26.3	− 63
21	38 42.4	181 18.4	·· 08.1	206 54.1	·· 12.7	33 52.2	·· 35.3	205 17.5	·· 13.2	286 22.5	116	·25 20.0	− 64
22	53 44.8	196 18.1	09.0	221 55.3	13.2	48 54.6	35.4	220 19.8	13.2	300 53.1	116	25 13.6	− 65
23	68 47.3	211 17.8	09.8	236 56.5	13.7	63 56.9	35.5	235 22.1	13.3	315 23.7	116	25 07.1	− 66
0	83 49.8	226 17.4	−12 10.7	251 57.7	− 3 14.2	78 59.3	+ 0 35.5	250 24.4	− 3 13.4	329 54.3	118	+25 00.5	− 68
1	98 52.2	241 17.1	11.6	266 58.9	14.8	94 01.6	35.6	265 26.7	13.4	344 25.1	117	24 53.7	− 68
2	113 54.7	256 16.7	12.5	282 00.1	15.3	109 04.0	35.7	280 29.0	13.5	358 55.8	119	24 46.9	− 70
3	128 57.2	271 16.4	·· 13.4	297 01.3	·· 15.8	124 06.3	·· 35.7	295 31.4	·· 13.5	13 26.7	119	·24 39.9	− 71
4	143 59.6	286 16.1	14.3	312 02.5	16.3	139 08.7	35.8	310 33.7	13.6	27 57.6	120	24 32.8	− 72
5	159 02.1	301 15.7	15.2	327 03.7	16.8	154 11.0	35.9	325 36.0	13.6	42 28.6	120	24 25.6	− 73
6	174 04.6	316 15.4	−12 16.1	342 04.9	− 3 17.3	169 13.4	+ 0 35.9	340 38.3	− 3 13.7	56 59.6	121	+24 18.3	− 74
7	189 07.0	331 15.0	17.0	357 06.1	17.9	184 15.7	36.0	355 40.6	13.7	71 30.7	121	24 10.9	− 75
8	204 09.5	346 14.7	17.9	12 07.3	18.4	199 18.0	36.1	10 42.9	13.8	86 01.8	123	24 03.4	− 76
9	219 11.9	1 14.3	·· 18.8	27 08.6	·· 18.9	214 20.4	·· 36.1	25 45.2	·· 13.8	100 33.1	122	·23 55.8	− 77
10	234 14.4	16 14.0	19.7	42 09.8	19.4	229 22.7	36.2	40 47.5	13.9	115 04.3	124	23 48.1	− 78
11	249 16.9	31 13.7	20.6	57 11.0	19.9	244 25.1	36.2	55 49.8	14.0	129 35.7	124	23 40.3	− 80
12	264 19.3	46 13.3	−12 21.5	72 12.2	− 3 20.4	259 27.4	+ 0 36.3	70 52.1	− 3 14.0	144 07.1	125	+23 32.3	− 80
13	279 21.8	61 13.0	22.4	87 13.4	21.0	274 29.7	36.4	85 54.4	14.1	158 38.6	125	23 24.3	− 81
14	294 24.3	76 12.6	23.3	102 14.6	21.5	289 32.1	36.4	100 56.7	14.1	173 10.1	126	23 16.2	− 83
15	309 26.7	91 12.3	·· 24.2	117 15.8	·· 22.0	304 34.4	·· 36.5	115 59.0	·· 14.2	187 41.7	127	·23 07.9	− 83
16	324 29.2	106 11.9	25.0	132 17.0	22.5	319 36.8	36.6	131 01.3	14.2	202 13.4	127	22 59.6	− 84
17	339 31.7	121 11.6	25.9	147 18.2	23.0	334 39.1	36.6	146 03.7	14.3	216 45.1	128	22 51.2	− 86
18	354 34.1	136 11.2	−12 26.8	162 19.4	− 3 23.5	349 41.4	+ 0 36.7	161 06.0	− 3 14.3	231 16.9	128	+22 42.6	− 86
19	9 36.6	151 10.9	27.7	177 20.6	24.1	4 43.8	36.8	176 08.3	14.4	245 48.7	130	22 34.0	− 87
20	24 39.1	166 10.5	28.6	192 21.8	24.6	19 46.1	36.8	191 10.6	14.4	260 20.7	129	22 25.3	− 88
21	39 41.5	181 10.2	·· 29.5	207 23.0	·· 25.1	34 48.5	·· 36.9	206 12.9	·· 14.5	274 52.6	131	·22 16.5	− 90
22	54 44.0	196 09.8	30.4	222 24.2	25.6	49 50.8	37.0	221 15.2	14.6	289 24.7	131	22 07.5	− 90
23	69 46.4	211 09.5	31.3	237 25.4	26.1	64 53.1	37.1	236 17.5	14.6	303 56.8	132	21 58.5	− 91
0	84 48.9	226 09.1	−12 32.2	252 26.7	− 3 26.6	79 55.5	+ 0 37.1	251 19.8	− 3 14.7	318 29.0	132	+21 49.4	− 92
1	99 51.4	241 08.8	33.1	267 27.9	27.2	94 57.8	37.2	266 22.1	14.7	333 01.2	133	21 40.2	− 93
2	114 53.8	256 08.4	33.9	282 29.1	27.7	110 00.2	37.3	281 24.4	14.8	347 33.5	133	21 30.9	− 94
3	129 56.3	271 08.1	·· 34.8	297 30.3	·· 28.2	125 02.5	·· 37.3	296 26.7	·· 14.8	2 05.8	135	·21 21.5	− 94
4	144 58.8	286 07.7	35.7	312 31.5	28.7	140 04.8	37.4	311 29.1	14.9	16 38.3	134	21 12.1	− 96
5	160 01.2	301 07.4	36.6	327 32.7	29.2	155 07.2	37.5	326 31.4	14.9	31 10.7	136	21 02.5	− 97
6	175 03.7	316 07.0	−12 37.5	342 33.9	− 3 29.7	170 09.5	+ 0 37.5	341 33.7	− 3 15.0	45 43.3	136	+20 52.8	− 97
7	190 06.2	331 06.7	38.4	357 35.1	30.3	185 11.8	37.6	356 36.0	15.0	60 15.9	137	20 43.1	− 98
8	205 08.6	346 06.3	39.3	12 36.3	30.8	200 14.2	37.7	11 38.3	15.1	74 48.6	137	20 33.3	− 99
9	220 11.1	1 06.0	·· 40.2	27 37.5	·· 31.3	215 16.5	·· 37.7	26 40.6	·· 15.1	89 21.3	138	·20 23.4	−100
10	235 13.6	16 05.6	41.0	42 38.7	31.8	230 18.8	37.8	41 42.9	15.2	103 54.1	138	20 13.4	−101
11	250 16.0	31 05.2	41.9	57 39.9	32.3	245 21.2	37.9	56 45.2	15.2	118 26.9	139	20 03.3	−102
12	265 18.5	46 04.9	−12 42.8	72 41.1	− 3 32.8	260 23.5	+ 0 37.9	71 47.5	− 3 15.3	132 59.8	140	+19 53.1	−102
13	280 20.9	61 04.5	43.7	87 42.4	33.3	275 25.8	38.0	86 49.8	15.4	147 32.8	140	19 42.9	−104
14	295 23.4	76 04.2	44.6	102 43.6	33.9	290 28.2	38.1	101 52.2	15.4	162 05.8	141	19 32.5	−104
15	310 25.9	91 03.8	·· 45.5	117 44.8	·· 34.4	305 30.5	·· 38.2	116 54.5	·· 15.5	176 38.9	141	·19 22.1	−105
16	325 28.3	106 03.4	46.4	132 46.0	34.9	320 32.8	38.2	131 56.8	15.5	191 12.0	142	19 11.6	−106
17	340 30.8	121 03.1	47.2	147 47.2	35.4	335 35.2	38.3	146 59.1	15.6	205 45.2	143	19 01.0	−106
18	355 33.3	136 02.7	−12 48.1	162 48.4	− 3 35.9	350 37.5	+ 0 38.4	162 01.4	− 3 15.6	220 18.5	143	+18 50.4	−107
19	10 35.7	151 02.4	49.0	177 49.6	36.4	5 39.8	38.4	177 03.7	15.7	234 51.8	143	18 39.7	−108
20	25 38.2	166 02.0	49.9	192 50.8	36.9	20 42.2	38.5	192 06.0	15.7	249 25.1	144	18 28.9	−109
21	40 40.7	181 01.6	·· 50.8	207 52.0	·· 37.5	35 44.5	·· 38.6	207 08.3	·· 15.8	263 58.5	145	·18 18.0	−110
22	55 43.1	196 01.3	51.7	222 53.2	38.0	50 46.8	38.6	222 10.7	15.8	278 32.0	145	18 07.0	−110
23	70 45.6	211 00.9	52.5	237 54.5	38.5	65 49.2	38.7	237 13.0	15.9	293 05.5	146	17 56.0	−111
24	85 48.1	226 00.5	−12 53.4	252 55.7	− 3 39.0	80 51.5	+ 0 38.8	252 15.3	− 3 15.9	307 39.1	146	+17 44.9	−112
code	—	− 3	− 9	+ 12	− 6	+ 23	+ 1	+ 23	− 1				

GCT	SUN GHA	SUN Dec.
h	° ′	° ′
0	181 20.3	−23 13.0
1	196 20.0	13.2
2	211 19.7	13.3
3	226 19.4 ··	13.5
4	241 19.1	13.6
5	256 18.8	13.8
6	271 18.5	−23 13.9
7	286 18.2	14.1
8	301 17.9	14.2
9	316 17.6 ··	14.4
10	331 17.3	14.5
11	346 17.0	14.6
12	1 16.7	−23 14.8
13	16 16.4	14.9
14	31 16.1	15.1
15	46 15.8 ··	15.2
16	61 15.5	15.3
17	76 15.2	15.5
18	91 14.9	−23 15.6
19	106 14.6	15.7
20	121 14.3	15.9
21	136 14.0 ··	16.0
22	151 13.7	16.1
23	166 13.4	16.3
0	181 13.1	−23 16.4
1	196 12.8	16.5
2	211 12.5	16.7
3	226 12.2 ··	16.8
4	241 11.9	16.9
5	256 11.6	17.0
6	271 11.3	−23 17.2
7	286 11.0	17.3
8	301 10.7	17.4
9	316 10.4 ··	17.5
10	331 10.1	17.7
11	346 09.8	17.8
12	1 09.5	−23 17.9
13	16 09.2	18.0
14	31 08.9	18.1
15	46 08.6 ··	18.3
16	61 08.3	18.4
17	76 08.0	18.5
18	91 07.7	−23 18.6
19	106 07.4	18.7
20	121 07.1	18.8
21	136 06.8 ··	19.0
22	151 06.5	19.1
23	166 06.2	19.2
0	181 05.8	−23 19.3
1	196 05.5	19.4
2	211 05.2	19.5
3	226 04.9 ··	19.6
4	241 04.6	19.7
5	256 04.3	19.8
6	271 04.0	−23 20.0
7	286 03.7	20.1
8	301 03.4	20.2
9	316 03.1 ··	20.3
10	331 02.8	20.4
11	346 02.5	20.5
12	1 02.2	−23 20.6
13	16 01.9	20.7
14	31 01.6	20.8
15	46 01.3 ··	20.9
16	61 01.0	21.0
17	76 00.7	21.1
18	91 00.4	−23 21.2
19	106 00.1	21.3
20	120 59.8	21.4
21	135 59.5 ··	21.4
22	150 59.2	21.5
23	165 58.9	21.6
24	180 58.5	−23 21.7
code	—	− 1

STARS No.	SHA	Dec.	Transit Mer. Gr.
	° ′	° ′	h m
1	358 31.4	+28 49.7	18 28
2	358 21.0	+58 53.4	18 28
3	349 42.1	−18 15.0	19 03
4	339 20.0	+59 59.5	19 44
5	336 00.5	−57 29.0	19 57
6	332 22.7	+89 02.7	20 12
7	328 52.8	+23 14.4	20 26
8	315 52.9	−40 29.8	21 18
9	309 46.3	+49 41.8	21 42
10	291 42.1	+16 25.0	22 54
11	281 56.1	− 8 15.2	23 33
12	281 42.3	+45 57.3	23 34
13	279 21.3	+ 6 18.6	23 43
14	279 10.7	+28 34.3	23 44
15	276 32.9	− 1 13.7	23 55
16	271 51.0	+ 7 24.1	0 17
17	264 16.2	−52 39.9	0 47
18	259 14.1	−16 38.8	1 08
19	255 48.5	−28 54.1	1 21
20	245 47.8	+ 5 21.1	2 01
21	244 23.8	+28 08.7	2 07
22	234 36.6	−59 21.0	2 46
23	223 26.3	−43 14.0	3 30
24	221 49.4	−69 30.8	3 37
25	218 41.3	− 8 26.9	3 49
26	208 32.5	+12 12.1	4 30
27	194 47.8	+62 00.3	5 25
28	183 20.7	+14 50.3	6 10
29	174 01.6	−62 49.7	6 47
30	172 52.9	−56 50.4	6 52
31	168 46.8	−59 25.4	7 08
32	167 01.1	+56 12.9	7 15
33	159 30.1	+55 10.2	7 45
34	159 20.2	−10 54.7	7 46
35	153 35.3	+49 32.8	8 09
36	149 02.5	−36 08.0	8 27
37	146 38.1	+19 25.7	8 37
38	140 55.7	−60 38.3	8 59
39	137 18.3	+74 20.8	9 14
40	126 50.4	+26 52.3	9 56
41	120 37.9	−22 29.3	10 20
42	113 23.4	−26 19.7	10 49
43	109 07.4	−68 56.6	11 06
44	103 05.9	−15 40.1	11 30
45	97 25.2	−37 04.4	11 53
46	96 49.7	+12 35.5	11 55
47	91 08.2	+51 29.5	12 18
48	84 45.5	−34 24.7	12 44
49	81 10.7	+38 44.2	12 58
50	76 55.9	−26 21.6	13 15
51	62 53.6	+ 8 44.4	14 11
52	54 32.3	−56 53.7	14 44
53	50 03.5	+45 06.6	15 02
54	34 32.7	+ 9 39.3	16 04
55	28 41.7	−47 11.9	16 27
56	16 14.9	−29 52.8	17 17
57	14 24.5	+14 56.9	17 24

Lat.	Sunrise	Twlt. begins	Moonrise 15	Moonrise 16	Moonrise 17	Moonrise 18
N °	h m	h m	h m	h m	h m	h m
70	■	6 41	□	□	16 31	19 12
68	■	6 33	□	□	17 27	19 34
66	10 28	6 27	□	15 43	18 00	19 51
64	9 47	6 21	13 57	16 34	18 24	20 04
62	9 19	6 16	15 22	17 05	18 43	20 16
60	8 58	6 11	15 58	17 28	18 58	20 26
58	8 40	6 07	16 24	17 47	19 11	20 34
56	8 26	6 03	16 44	18 03	19 22	20 41
54	8 13	5 59	17 01	18 16	19 32	20 48
52	8 02	5 55	17 16	18 27	19 41	20 54
50	7 52	5 52	17 28	18 38	19 49	20 59
45	7 32	5 44	17 54	18 59	20 05	21 11
40	7 15	5 37	18 15	19 16	20 19	21 20
35	7 01	5 29	18 32	19 31	20 30	21 28
30	6 49	5 23	18 46	19 43	20 40	21 35
20	6 27	5 08	19 11	20 05	20 57	21 48
10	6 09	4 53	19 33	20 23	21 11	21 58
0	5 52	4 36	19 53	20 40	21 25	22 08
10	5 34	4 16	20 13	20 57	21 39	22 18
20	5 15	3 51	20 34	21 16	21 54	22 28
30	4 53	3 17	20 58	21 37	22 10	22 40
35	4 40	2 53	21 13	21 49	22 20	22 47
40	4 25	2 22	21 29	22 03	22 31	22 55
45	4 08	1 35	21 49	22 19	22 43	23 04
50	3 45	////	22 14	22 40	22 59	23 15
52	3 34	////	22 26	22 49	23 06	23 20
54	3 22	////	22 40	23 00	23 14	23 25
56	3 08	////	22 56	23 12	23 23	23 31
58	2 51	////	23 14	23 26	23 33	23 38
60	2 31	////	23 37	23 43	23 45	23 46
S						

Lat.	Sunset	Twlt. ends	Moonset 15	Moonset 16	Moonset 17	Moonset 18
N °	h m	h m	h m	h m	h m	h m
70	■	17 09	□	□	14 14	13 04
68	■	17 16	□	□	13 17	12 40
66	13 23	17 23	□	13 26	12 43	12 22
64	14 04	17 29	13 31	12 34	12 18	12 07
62	14 32	17 34	12 06	12 02	11 58	11 54
60	14 53	17 39	11 29	11 38	11 42	11 44
58	15 10	17 43	11 02	11 19	11 29	11 34
56	15 25	17 47	10 42	11 03	11 17	11 26
54	15 38	17 51	10 24	10 49	11 06	11 18
52	15 49	17 55	10 10	10 37	10 57	11 12
50	15 58	17 57	9 57	10 26	10 49	11 06
45	16 19	18 06	9 30	10 04	10 31	10 53
40	16 36	18 14	9 09	9 46	10 16	10 42
35	16 50	18 21	8 51	9 31	10 04	10 33
30	17 02	18 27	8 36	9 17	9 53	10 25
20	17 23	18 42	8 10	8 54	9 34	10 10
10	17 42	18 57	7 48	8 35	9 18	9 58
0	17 59	19 14	7 27	8 16	9 02	9 46
10	18 16	19 34	7 06	7 57	8 47	9 34
20	18 35	19 59	6 43	7 37	8 30	9 21
30	18 57	20 33	6 17	7 14	8 11	9 07
35	19 10	20 57	6 02	7 00	7 59	8 58
40	19 25	21 28	5 44	6 44	7 46	8 48
45	19 43	22 15	5 22	6 25	7 31	8 37
50	20 06	////	4 54	6 01	7 12	8 23
52	20 16	////	4 40	5 50	7 03	8 16
54	20 29	////	4 24	5 36	6 52	8 09
56	20 43	////	4 05	5 21	6 41	8 00
58	20 59	////	3 42	5 03	6 27	7 51
60	21 20	////	3 11	4 40	6 11	7 40
S						

Equation of Time (App.—Mean)

GCT	15	16	17
h	m s	m s	m s
0	+ 5 21.7	+ 4 53.0	+ 4 24.0
6	+ 5 14.5	+ 4 45.8	+ 4 16.7
12	+ 5 07.4	+ 4 38.5	+ 4 09.4
18	+ 5 00.2	+ 4 31.3	+ 4 02.1
24	+ 4 53.0	+ 4 24.0	+ 3 54.8

GCT of Transit Meridian of Greenwich

DAY	Moon	Venus	Mars	Jupiter	Saturn
	h m	h m	h m	h m	h m
15	1 15	8 55	7 14	18 45	7 21
16	2 04	8 55	7 12	18 41	7 17
17	2 51	8 56	7 10	18 37	7 14
18	3 36	8 56	7 08	18 34	7 10

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb	Venus	Mars
°	′	′	′
0	0.6	0.1	0.1
30	0.6	0.1	0.1
45	0.6	0.1	0.1
60	0.6	0.1	0.0
75	0.6	0.0	0.0
90			

Moon's Lower Limb *Add*

Alt.	15	16	17
°	′	′	′
0	11.7	11.7	11.9
4	11.7	11.7	11.9
8	11.8	11.8	11.9
12	11.8	11.8	11.9
16	11.9	11.9	12.0
20	12.0	12.0	12.1
24	12.0	12.0	12.2
28	12.1	12.1	12.2
32	12.2	12.2	12.4
36	12.4	12.4	12.5
40	12.5	12.5	12.6
44	12.6	12.6	12.7
48	12.8	12.8	12.9
52	13.0	13.0	13.1
56	13.1	13.1	13.2
60	13.3	13.3	13.4
64	13.5	13.5	13.6
68	13.7	13.7	13.8
72	13.9	13.9	14.0
76	14.1	14.1	14.2
80	14.3	14.3	14.4
84	14.5	14.5	14.6
88	14.7	14.7	14.7
90			

Add to table, back cover

Moon's Upper Limb *Subtract*

Alt.	15	16	17
°	′	′	′
0	17.7	17.7	17.7
4	17.7	17.7	17.6
8	17.7	17.7	17.6
12	17.6	17.6	17.6
16	17.6	17.6	17.5
20	17.5	17.5	17.5
24	17.4	17.4	17.4
28	17.3	17.3	17.3
32	17.2	17.2	17.2
36	17.1	17.1	17.0
40	17.0	17.0	16.9
44	16.8	16.8	16.8
48	16.7	16.7	16.6
52	16.5	16.5	16.5
56	16.3	16.3	16.3
60	16.1	16.1	16.1
64	16.0	16.0	15.9
68	15.8	15.8	15.8
72	15.6	15.6	15.6
76	15.4	15.4	15.4
80	15.2	15.2	15.2
84	14.9	14.9	15.0
88	14.8	14.8	14.8
90			

Subtract from table, back cover

GCT	♈ GHA	VENUS −3.7 GHA	VENUS Dec.	MARS 1.4 GHA	MARS Dec.	JUPITER −2.1 GHA	JUPITER Dec.	SATURN 1.0 GHA	SATURN Dec.	MOON GHA	code	MOON Dec.	code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
0	85 48.1	226 00.5	−12 53.4	252 55.7	− 3 39.0	80 51.5	+ 0 38.8	252 15.3	− 3 15.9	307 39.1	146	+17 44.9	−112
1	100 50.5	241 00.2	54.3	267 56.9	39.5	95 53.8	38.9	267 17.6	16.0	322 12.7	147	17 33.7	−113
2	115 53.0	255 59.8	55.2	282 58.1	40.0	110 56.1	38.9	282 19.9	16.0	336 46.4	147	17 22.4	−113
3	130 55.4	270 59.4	·· 56.1	297 59.3	·· 40.5	125 58.5	·· 39.0	297 22.2	·· 16.1	351 20.1	148	·17 11.1	−114
4	145 57.9	285 59.1	56.9	313 00.5	41.1	141 00.8	39.1	312 24.5	16.1	5 53.9	149	16 59.7	−115
5	161 00.4	300 58.7	57.8	328 01.7	41.6	156 03.1	39.1	327 26.8	16.2	20 27.8	148	16 48.2	−115
6	176 02.8	315 58.3	−12 58.7	343 02.9	− 3 42.1	171 05.5	+ 0 39.2	342 29.2	− 3 16.2	35 01.6	150	+16 36.7	−116
7	191 05.3	330 58.0	12 59.6	358 04.1	42.6	186 07.8	39.3	357 31.5	16.3	49 35.6	149	16 25.1	−117
8	206 07.8	345 57.6	13 00.5	13 05.3	43.1	201 10.1	39.4	12 33.8	16.4	64 09.5	151	16 13.4	−118
9	221 10.2	0 57.2	·· 01.3	28 06.6	·· 43.6	216 12.4	·· 39.4	27 36.1	·· 16.4	78 43.6	150	·16 01.6	−118
10	236 12.7	15 56.9	02.2	43 07.8	44.1	231 14.8	39.5	42 38.4	16.5	93 17.6	152	15 49.8	−119
11	251 15.2	30 56.5	03.1	58 09.0	44.6	246 17.1	39.6	57 40.7	16.5	107 51.8	151	15 37.9	−119
12	266 17.6	45 56.1	−13 04.0	73 10.2	− 3 45.2	261 19.4	+ 0 39.6	72 43.0	− 3 16.6	122 25.9	152	+15 26.0	−120
13	281 20.1	60 55.8	04.9	88 11.4	45.7	276 21.8	39.7	87 45.4	16.6	137 00.1	153	15 14.0	−121
14	296 22.6	75 55.4	05.7	103 12.6	46.2	291 24.1	39.8	102 47.7	16.7	151 34.4	153	15 01.9	−121
15	311 25.0	90 55.0	·· 06.6	118 13.8	·· 46.7	306 26.4	·· 39.9	117 50.0	·· 16.7	166 08.7	153	·14 49.8	−122
16	326 27.5	105 54.6	07.5	133 15.0	47.2	321 28.7	39.9	132 52.3	16.8	180 43.0	154	14 37.6	−123
17	341 29.9	120 54.3	08.4	148 16.3	47.7	336 31.1	40.0	147 54.6	16.8	195 17.4	154	14 25.3	−123
18	356 32.4	135 53.9	−13 09.2	163 17.5	− 3 48.2	351 33.4	+ 0 40.1	162 56.9	− 3 16.9	209 51.8	154	+14 13.0	−124
19	11 34.9	150 53.5	10.1	178 18.7	48.7	6 35.7	40.2	177 59.2	16.9	224 26.2	155	14 00.6	−124
20	26 37.3	165 53.1	11.0	193 19.9	49.2	21 38.0	40.2	193 01.6	17.0	239 00.7	155	13 48.2	−125
21	41 39.8	180 52.8	·· 11.9	208 21.1	·· 49.8	36 40.4	·· 40.3	208 03.9	·· 17.0	253 35.2	156	·13 35.7	−126
22	56 42.3	195 52.4	12.7	223 22.3	50.3	51 42.7	40.4	223 06.2	17.1	268 09.8	156	13 23.1	−126
23	71 44.7	210 52.0	13.6	238 23.5	50.8	66 45.0	40.5	238 08.5	17.1	282 44.4	156	13 10.5	−127
0	86 47.2	225 51.6	−13 14.5	253 24.8	− 3 51.3	81 47.3	+ 0 40.5	253 10.8	− 3 17.2	297 19.0	157	+12 57.8	−127
1	101 49.7	240 51.2	15.4	268 26.0	51.8	96 49.6	40.6	268 13.1	17.2	311 53.7	157	12 45.1	−128
2	116 52.1	255 50.9	16.2	283 27.2	52.3	111 52.0	40.7	283 15.4	17.3	326 28.4	157	12 32.3	−128
3	131 54.6	270 50.5	·· 17.1	298 28.4	·· 52.8	126 54.3	·· 40.7	298 17.8	·· 17.3	341 03.1	158	·12 19.5	−129
4	146 57.0	285 50.1	18.0	313 29.6	53.3	141 56.6	40.8	313 20.1	17.4	355 37.9	158	12 06.6	−129
5	161 59.5	300 49.7	18.8	328 30.8	53.8	156 58.9	40.9	328 22.4	17.4	10 12.7	158	11 53.7	−130
6	177 02.0	315 49.3	−13 19.7	343 32.0	− 3 54.4	172 01.3	+ 0 41.0	343 24.7	− 3 17.5	24 47.5	158	+11 40.7	−131
7	192 04.4	330 49.0	20.6	358 33.2	54.9	187 03.6	41.0	358 27.0	17.5	39 22.3	159	11 27.6	−130
8	207 06.9	345 48.6	21.5	13 34.5	55.4	202 05.9	41.1	13 29.3	17.6	53 57.2	159	11 14.6	−132
9	222 09.4	0 48.2	·· 22.3	28 35.7	·· 55.9	217 08.2	·· 41.2	28 31.7	·· 17.6	68 32.1	159	·11 01.4	−132
10	237 11.8	15 47.8	23.2	43 36.9	56.4	232 10.5	41.3	43 34.0	17.7	83 07.0	160	10 48.2	−132
11	252 14.3	30 47.4	24.1	58 38.1	56.9	247 12.9	41.4	58 36.3	17.7	97 42.0	159	10 35.0	−133
12	267 16.8	45 47.0	−13 24.9	73 39.3	− 3 57.4	262 15.2	+ 0 41.4	73 38.6	− 3 17.8	112 16.9	160	+10 21.7	−134
13	282 19.2	60 46.6	25.8	88 40.5	57.9	277 17.5	41.5	88 40.9	17.8	126 51.9	161	10 08.3	−133
14	297 21.7	75 46.3	26.7	103 41.8	58.4	292 19.8	41.6	103 43.3	17.9	141 27.0	160	9 55.0	−135
15	312 24.2	90 45.9	·· 27.5	118 43.0	·· 58.9	307 22.1	·· 41.7	118 45.6	·· 17.9	156 02.0	160	· 9 41.5	−135
16	327 26.6	105 45.5	28.4	133 44.2	3 59.4	322 24.4	41.7	133 47.9	18.0	170 37.0	161	9 28.0	−135
17	342 29.1	120 45.1	29.3	148 45.4	4 00.0	337 26.8	41.8	148 50.2	18.0	185 12.1	161	9 14.5	−135
18	357 31.5	135 44.7	−13 30.1	163 46.6	− 4 00.5	352 29.1	+ 0 41.9	163 52.5	− 3 18.1	199 47.2	161	+ 9 01.0	−136
19	12 34.0	150 44.3	31.0	178 47.8	01.0	7 31.4	42.0	178 54.8	18.1	214 22.3	161	8 47.4	−137
20	27 36.5	165 43.9	31.9	193 49.0	01.5	22 33.7	42.0	193 57.2	18.2	228 57.4	161	8 33.7	−137
21	42 38.9	180 43.5	·· 32.7	208 50.3	·· 02.0	37 36.0	·· 42.1	208 59.5	·· 18.2	243 32.5	162	· 8 20.0	−137
22	57 41.4	195 43.2	33.6	223 51.5	02.5	52 38.3	42.2	224 01.8	18.3	258 07.7	161	8 06.3	−138
23	72 43.9	210 42.8	34.5	238 52.7	03.0	67 40.7	42.3	239 04.1	18.3	272 42.8	162	7 52.5	−138
0	87 46.3	225 42.4	−13 35.3	253 53.9	− 4 03.5	82 43.0	+ 0 42.3	254 06.4	− 3 18.4	287 18.0	162	+ 7 38.7	−139
1	102 48.8	240 42.0	36.2	268 55.1	04.0	97 45.3	42.4	269 08.8	18.4	301 53.2	162	7 24.8	−139
2	117 51.3	255 41.6	37.1	283 56.3	04.5	112 47.6	42.5	284 11.1	18.5	316 28.4	161	7 10.9	−139
3	132 53.7	270 41.2	·· 37.9	298 57.6	·· 05.0	127 49.9	·· 42.6	299 13.4	·· 18.5	331 03.5	162	· 6 57.0	−139
4	147 56.2	285 40.8	38.8	313 58.8	05.5	142 52.2	42.7	314 15.7	18.6	345 38.7	162	6 43.1	−141
5	162 58.7	300 40.4	39.7	329 00.0	06.1	157 54.6	42.7	329 18.0	18.6	0 13.9	162	6 29.0	−140
6	178 01.1	315 40.0	−13 40.5	344 01.2	− 4 06.6	172 56.9	+ 0 42.8	344 20.4	− 3 18.7	14 49.1	162	+ 6 15.0	−141
7	193 03.6	330 39.6	41.4	359 02.4	07.1	187 59.2	42.9	359 22.7	18.7	29 24.3	162	6 00.9	−141
8	208 06.0	345 39.2	42.2	14 03.7	07.6	203 01.5	43.0	14 25.0	18.8	43 59.5	163	5 46.8	−141
9	223 08.5	0 38.8	·· 43.1	29 04.9	·· 08.1	218 03.8	·· 43.0	29 27.3	·· 18.8	58 34.8	162	· 5 32.7	−142
10	238 11.0	15 38.4	44.0	44 06.1	08.6	233 06.1	43.1	44 29.6	18.9	73 10.0	162	5 18.5	−142
11	253 13.4	30 38.0	44.8	59 07.3	09.1	248 08.4	43.2	59 32.0	18.9	87 45.2	162	5 04.3	−142
12	268 15.9	45 37.6	−13 45.7	74 08.5	− 4 09.6	263 10.7	+ 0 43.3	74 34.3	− 3 19.0	102 20.4	162	+ 4 50.1	−143
13	283 18.4	60 37.2	46.5	89 09.7	10.1	278 13.1	43.4	89 36.6	19.0	116 55.6	161	4 35.8	−143
14	298 20.8	75 36.8	47.4	104 11.0	10.6	293 15.4	43.4	104 38.9	19.1	131 30.7	162	4 21.5	−143
15	313 23.3	90 36.4	·· 48.3	119 12.2	·· 11.1	308 17.7	·· 43.5	119 41.2	·· 19.1	146 05.9	162	· 4 07.2	−144
16	328 25.8	105 36.0	49.1	134 13.4	11.6	323 20.0	43.6	134 43.6	19.1	160 41.1	162	3 52.8	−144
17	343 28.2	120 35.6	50.0	149 14.6	12.1	338 22.3	43.7	149 45.9	19.2	175 16.3	161	3 38.4	−144
18	358 30.7	135 35.2	−13 50.8	164 15.8	− 4 12.6	353 24.6	+ 0 43.8	164 48.2	− 3 19.2	189 51.4	161	+ 3 24.0	−144
19	13 33.2	150 34.8	51.7	179 17.1	13.1	8 26.9	43.8	179 50.5	19.3	204 26.5	162	3 09.6	−145
20	28 35.6	165 34.4	52.6	194 18.3	13.7	23 29.2	43.9	194 52.9	19.3	219 01.7	161	2 55.1	−145
21	43 38.1	180 34.0	·· 53.4	209 19.5	·· 14.2	38 31.5	·· 44.0	209 55.2	·· 19.4	233 36.8	161	· 2 40.6	−145
22	58 40.5	195 33.6	54.3	224 20.7	14.7	53 33.8	44.1	224 57.5	19.4	248 11.9	161	2 26.1	−145
23	73 43.0	210 33.2	55.1	239 21.9	15.2	68 36.1	44.2	239 59.8	19.5	262 47.0	160	2 11.6	−146
24	88 45.5	225 32.8	−13 56.0	254 23.2	− 4 15.7	83 38.5	+ 0 44.2	255 02.1	− 3 19.5	277 22.0	161	+ 1 57.0	−145
code	—	− 4	− 9	+ 12	− 5	+ 23	+ 1	+ 23	0				

GCT h	SUN GHA ° ′	Dec. ° ′
18		
0	180 58.5	−23 21.7
1	195 58.2	21.8
2	210 57.9	21.9
3	225 57.6 ··	22.0
4	240 57.3	22.1
5	255 57.0	22.2
6	270 56.7	−23 22.3
7	285 56.4	22.3
8	300 56.1	22.4
9	315 55.8 ··	22.5
10	330 55.5	22.6
11	345 55.2	22.7
12	0 54.9	−23 22.8
13	15 54.6	22.8
14	30 54.3	22.9
15	45 54.0 ··	23.0
16	60 53.6	23.1
17	75 53.3	23.2
18	90 53.0	−23 23.2
19	105 52.7	23.3
20	120 52.4	23.4
21	135 52.1 ··	23.5
22	150 51.8	23.5
23	165 51.5	23.6
19		
0	180 51.2	−23 23.7
1	195 50.9	23.8
2	210 50.6	23.8
3	225 50.3 ··	23.9
4	240 50.0	24.0
5	255 49.7	24.0
6	270 49.3	−23 24.1
7	285 49.0	24.2
8	300 48.7	24.2
9	315 48.4 ··	24.3
10	330 48.1	24.4
11	345 47.8	24.4
12	0 47.5	−23 24.5
13	15 47.2	24.6
14	30 46.9	24.6
15	45 46.6 ··	24.7
16	60 46.3	24.7
17	75 46.0	24.8
18	90 45.6	−23 24.9
19	105 45.3	24.9
20	120 45.0	25.0
21	135 44.7 ··	25.0
22	150 44.4	25.1
23	165 44.1	25.1
20		
0	180 43.8	−23 25.2
1	195 43.5	25.2
2	210 43.2	25.3
3	225 42.9 ··	25.3
4	240 42.6	25.4
5	255 42.2	25.4
6	270 41.9	−23 25.5
7	285 41.6	25.5
8	300 41.3	25.6
9	315 41.0 ··	25.6
10	330 40.7	25.7
11	345 40.4	25.7
12	0 40.1	−23 25.8
13	15 39.8	25.8
14	30 39.5	25.8
15	45 39.1 ··	25.9
16	60 38.8	25.9
17	75 38.5	26.0
18	90 38.2	−23 26.0
19	105 37.9	26.0
20	120 37.6	26.1
21	135 37.3 ··	26.1
22	150 37.0	26.1
23	165 36.7	26.2
24	180 36.4	−23 26.2
code	—	− 1

STARS No.	SHA ° ′	Dec. ° ′	Transit Mer. Gr. h m
1	358 31.4	+28 49.7	18 16
2	358 21.0	+58 53.4	18 16
3	349 42.1	−18 15.0	18 51
4	339 20.0	+59 59.5	19 32
5	336 00.5	−57 29.0	19 46
6	332 23.4	+89 02.7	20 00
7	328 52.8	+23 14.4	20 14
8	315 52.9	−40 29.8	21 06
9	309 46.3	+49 41.8	21 30
10	291 42.1	+16 25.0	22 42
11	281 56.1	− 8 15.2	23 21
12	281 42.3	+45 57.3	23 22
13	279 21.3	+ 6 18.6	23 32
14	279 10.7	+28 34.3	23 32
15	276 32.9	− 1 13.7	23 43
16	271 51.0	+ 7 24.1	0 05
17	264 16.1	−52 39.9	0 36
18	259 14.1	−16 38.8	0 56
19	255 48.5	−28 54.2	1 09
20	245 47.8	+ 5 21.1	1 49
21	244 23.8	+28 08.7	1 55
22	234 36.6	−59 21.0	2 34
23	223 26.3	−43 14.0	3 19
24	221 49.4	−69 30.8	3 25
25	218 41.3	− 8 26.9	3 38
26	208 32.5	+12 12.1	4 18
27	194 47.8	+62 00.3	5 13
28	183 20.7	+14 50.3	5 58
29	174 01.5	−62 49.8	6 36
30	172 52.9	−56 50.4	6 40
31	168 46.8	−59 25.4	6 57
32	167 01.1	+56 12.9	7 04
33	159 30.1	+55 10.2	7 34
34	159 20.2	−10 54.7	7 34
35	153 35.3	+49 32.8	7 57
36	149 02.5	−36 08.0	8 15
37	146 38.0	+19 25.7	8 25
38	140 55.7	−60 38.3	8 48
39	137 18.3	+74 20.8	9 02
40	126 50.4	+26 52.3	9 44
41	120 37.9	−22 29.3	10 09
42	113 23.4	−26 19.7	10 38
43	109 07.4	−68 56.6	10 55
44	103 05.9	−15 40.1	11 19
45	97 25.1	−37 04.4	11 41
46	96 49.7	+12 35.5	11 44
47	91 08.2	+51 29.5	12 06
48	84 45.5	−34 24.7	12 32
49	81 10.7	+38 44.2	12 46
50	76 55.9	−26 21.6	13 03
51	62 53.6	+ 8 44.3	13 59
52	54 32.3	−56 53.7	14 32
53	50 03.5	+45 06.6	14 50
54	34 32.7	+ 9 39.3	15 52
55	28 41.7	−47 11.9	16 15
56	16 14.9	−29 52.8	17 05
57	14 24.5	+14 56.9	17 12

Lat.	Sunrise	Twlt. begins	Moonrise 18	19	20	21
N °	h m	h m	h m	h m	h m	h m
70	■	6 43	19 12	21 13	23 06	25 01
68	■	6 35	19 34	21 23	23 09	24 56
66	10 32	6 29	19 51	21 32	23 11	24 51
64	9 50	6 23	20 04	21 39	23 13	24 48
62	9 22	6 18	20 16	21 45	23 14	24 45
60	9 00	6 13	20 26	21 51	23 15	24 42
58	8 43	6 09	20 34	21 55	23 17	24 40
56	8 28	6 05	20 41	21 59	23 18	24 38
54	8 15	6 02	20 48	22 03	23 19	24 36
52	8 04	5 58	20 54	22 06	23 19	24 34
50	7 54	5 54	20 59	22 09	23 20	24 32
45	7 34	5 46	21 11	22 16	23 22	24 29
40	7 17	5 38	21 20	22 21	23 23	24 26
35	7 03	5 31	21 28	22 26	23 24	24 24
30	6 50	5 24	21 35	22 30	23 25	24 22
20	6 29	5 10	21 48	22 37	23 27	24 18
10	6 11	4 55	21 58	22 44	23 29	24 15
0	5 53	4 38	22 08	22 49	23 30	24 12
10	5 35	4 17	22 18	22 55	23 32	24 09
20	5 16	3 52	22 28	23 01	23 33	24 06
30	4 54	3 17	22 40	23 08	23 35	24 03
35	4 41	2 54	22 47	23 12	23 36	24 01
40	4 26	2 23	22 55	23 17	23 37	23 58
45	4 08	1 35	23 04	23 22	23 39	23 56
50	3 46	////	23 15	23 28	23 40	23 53
52	3 35	////	23 20	23 31	23 41	23 51
54	3 23	////	23 25	23 34	23 42	23 50
56	3 08	////	23 31	23 37	23 43	23 48
58	2 52	////	23 38	23 41	23 44	23 47
60	2 31	////	23 46	23 45	23 45	23 45
S						

Lat.	Sunset	Twlt. ends	Moonset 18	19	20	21
N °	h m	h m	h m	h m	h m	h m
70	■	17 09	13 04	12 30	12 03	11 39
68	■	17 16	12 40	12 17	11 58	11 40
66	13 21	17 23	12 22	12 07	11 54	11 41
64	14 03	17 29	12 07	11 58	11 50	11 42
62	14 32	17 35	11 54	11 50	11 46	11 42
60	14 53	17 39	11 44	11 44	11 44	11 43
58	15 11	17 44	11 34	11 38	11 41	11 43
56	15 25	17 47	11 26	11 33	11 39	11 44
54	15 38	17 51	11 18	11 28	11 37	11 44
52	15 49	17 55	11 12	11 24	11 35	11 45
50	15 59	17 59	11 06	11 20	11 33	11 45
45	16 20	18 07	10 53	11 12	11 29	11 46
40	16 37	18 15	10 42	11 05	11 26	11 47
35	16 51	18 22	10 33	10 59	11 23	11 47
30	17 03	18 29	10 25	10 53	11 21	11 48
20	17 25	18 44	10 10	10 44	11 16	11 48
10	17 43	18 58	9 58	10 36	11 12	11 49
0	18 01	19 16	9 46	10 28	11 09	11 50
10	18 18	19 36	9 34	10 20	11 05	11 51
20	18 37	20 01	9 21	10 12	11 01	11 51
30	18 59	20 36	9 07	10 02	10 57	11 52
35	19 12	20 59	8 58	9 56	10 54	11 53
40	19 27	21 30	8 48	9 50	10 51	11 53
45	19 45	22 18	8 37	9 42	10 47	11 54
50	20 08	////	8 23	9 33	10 43	11 54
52	20 19	////	8 16	9 29	10 41	11 55
54	20 31	////	8 09	9 24	10 39	11 55
56	20 45	////	8 00	9 19	10 37	11 55
58	21 02	////	7 51	9 13	10 34	11 56
60	21 22	////	7 40	9 06	10 31	11 56
S						

GCT h	Equation of Time (App.—Mean) 18 m s	19 m s	20 m s
0	+ 3 54.8	+ 3 25.4	+ 2 55.8
6	+ 3 47.5	+ 3 18.0	+ 2 48.4
12	+ 3 40.1	+ 3 10.6	+ 2 40.9
18	+ 3 32.7	+ 3 03.2	+ 2 33.5
24	+ 3 25.4	+ 2 55.8	+ 2 26.1

GCT of Transit Meridian of Greenwich

DAY	Moon h m	Venus h m	Mars h m	Jupiter h m	Saturn h m
18	3 36	8 56	7 08	18 34	7 10
19	4 18	8 57	7 06	18 30	7 06
20	4 59	8 57	7 04	18 26	7 03
21	5 40	8 58	7 02	18 23	6 59

ADDITIONAL ALTITUDE CORRECTIONS

Alt. °	Sun's Low'r Limb ′	Venus ′	Mars ′
0			
30	0.6	0.1	0.1
45	0.6	0.1	0.1
60	0.6	0.1	0.1
75	0.6	0.1	0.0
90	0.6	0.0	0.0

Moon's Lower Limb

Add

Alt. °	18 ′	19 ′	20 ′
0	12.1	12.6	13.3
4	12.1	12.6	13.3
8	12.2	12.7	13.3
12	12.2	12.7	13.3
16	12.2	12.7	13.3
20	12.3	12.8	13.4
24	12.4	12.9	13.4
28	12.5	12.9	13.5
32	12.6	13.0	13.6
36	12.7	13.1	13.6
40	12.8	13.2	13.7
44	12.9	13.3	13.8
48	13.1	13.4	13.9
52	13.2	13.6	14.0
56	13.4	13.7	14.1
60	13.5	13.8	14.2
64	13.7	14.0	14.3
68	13.9	14.1	14.4
72	14.1	14.3	14.6
76	14.3	14.4	14.7
80	14.4	14.6	14.8
84	14.6	14.8	14.9
88	14.8	14.9	15.0
90			

Add to table, back cover

Moon's Upper Limb

Subtract

Alt. °	18 ′	19 ′	20 ′
0	17.5	17.2	16.9
4	17.5	17.2	16.8
8	17.5	17.2	16.8
12	17.4	17.2	16.8
16	17.4	17.1	16.8
20	17.3	17.1	16.7
24	17.2	17.0	16.7
28	17.2	16.9	16.6
32	17.1	16.8	16.6
36	16.9	16.7	16.5
40	16.8	16.6	16.4
44	16.7	16.5	16.3
48	16.6	16.4	16.2
52	16.4	16.3	16.1
56	16.2	16.1	16.0
60	16.1	16.0	15.9
64	15.9	15.9	15.8
68	15.7	15.7	15.7
72	15.6	15.6	15.6
76	15.4	15.4	15.4
80	15.2	15.2	15.3
84	15.0	15.1	15.2
88	14.9	15.0	15.1
90			

Subtract from table, back cover

GCT	♈	VENUS −3.7		MARS 1.4		JUPITER −2.1		SATURN 1.0		MOON			
	GHA	GHA	Dec.	GHA	Dec.	GHA	Dec.	GHA	Dec.	GHA	code	Dec.	code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
0	88 45.5	225 32.8	−13 56.0	254 23.2	− 4 15.7	83 38.5	+ 0 44.2	255 02.1	− 3 19.5	277 22.0	161	+ 1 57.0	−145
1	103 47.9	240 32.4	56.8	269 24.4	16.2	98 40.8	44.3	270 04.5	19.6	291 57.1	160	1 42.5	−146
2	118 50.4	255 32.0	57.7	284 25.6	16.7	113 43.1	44.4	285 06.8	19.6	306 32.1	160	1 27.9	−147
3	133 52.9	270 31.6	·· 58.5	299 26.8	·· 17.2	128 45.4	·· 44.5	300 09.1	·· 19.7	321 07.1	159	· 1 13.2	−146
4	148 55.3	285 31.2	13 59.4	314 28.0	17.7	143 47.7	44.6	315 11.4	19.7	335 42.0	160	0 58.6	−147
5	163 57.8	300 30.8	14 00.2	329 29.3	18.2	158 50.0	44.6	330 13.8	19.8	350 17.0	159	0 43.9	−147
6	179 00.3	315 30.3	−14 01.1	344 30.5	− 4 18.7	173 52.3	+ 0 44.7	345 16.1	− 3 19.8	4 51.9	159	+ 0 29.2	−147
7	194 02.7	330 29.9	02.0	359 31.7	19.2	188 54.6	44.8	0 18.4	19.9	19 26.8	159	+ 0 14.5	−147
8	209 05.2	345 29.5	02.8	14 32.9	19.7	203 56.9	44.9	15 20.7	19.9	34 01.7	158	− 0 00.2	−147
9	224 07.6	0 29.1	·· 03.7	29 34.1	·· 20.2	218 59.2	·· 45.0	30 23.1	·· 20.0	48 36.5	158	· 0 14.9	−147
10	239 10.1	15 28.7	04.5	44 35.4	20.7	234 01.5	45.0	45 25.4	20.0	63 11.3	158	0 29.6	−148
11	254 12.6	30 28.3	05.4	59 36.6	21.2	249 03.8	45.1	60 27.7	20.1	77 46.1	157	0 44.4	−148
12	269 15.0	45 27.9	−14 06.2	74 37.8	− 4 21.7	264 06.1	+ 0 45.2	75 30.0	− 3 20.1	92 20.8	157	− 0 59.2	−148
13	284 17.5	60 27.5	07.1	89 39.0	22.2	279 08.4	45.3	90 32.4	20.1	106 55.5	157	1 14.0	−148
14	299 20.0	75 27.0	07.9	104 40.3	22.7	294 10.7	45.4	105 34.7	20.2	121 30.2	156	1 28.8	−148
15	314 22.4	90 26.6	·· 08.8	119 41.5	·· 23.2	309 13.0	·· 45.5	120 37.0	·· 20.2	136 04.8	156	· 1 43.6	−148
16	329 24.9	105 26.2	09.6	134 42.7	23.7	324 15.3	45.5	135 39.3	20.3	150 39.4	156	1 58.4	−148
17	344 27.4	120 25.8	10.5	149 43.9	24.2	339 17.7	45.6	150 41.7	20.3	165 14.0	155	2 13.2	−149
18	359 29.8	135 25.4	−14 11.3	164 45.1	− 4 24.8	354 20.0	+ 0 45.7	165 44.0	− 3 20.4	179 48.5	155	− 2 28.1	−148
19	14 32.3	150 25.0	12.2	179 46.4	25.3	9 22.3	45.8	180 46.3	20.4	194 23.0	154	2 42.9	−149
20	29 34.8	165 24.6	13.0	194 47.6	25.8	24 24.6	45.9	195 48.6	20.5	208 57.4	154	2 57.8	−148
21	44 37.2	180 24.1	·· 13.8	209 48.8	·· 26.3	39 26.9	·· 46.0	210 51.0	·· 20.5	223 31.8	153	· 3 12.6	−149
22	59 39.7	195 23.7	14.7	224 50.0	26.8	54 29.2	46.0	225 53.3	20.6	238 06.1	153	3 27.5	−148
23	74 42.1	210 23.3	15.5	239 51.3	27.3	69 31.5	46.1	240 55.6	20.6	252 40.4	152	3 42.3	−149
0	89 44.6	225 22.9	−14 16.4	254 52.5	− 4 27.8	84 33.8	+ 0 46.2	255 57.9	− 3 20.7	267 14.6	152	− 3 57.2	−149
1	104 47.1	240 22.5	17.2	269 53.7	28.3	99 36.1	46.3	271 00.3	20.7	281 48.8	151	4 12.1	−149
2	119 49.5	255 22.0	18.1	284 54.9	28.8	114 38.4	46.4	286 02.6	20.7	296 22.9	151	4 27.0	−148
3	134 52.0	270 21.6	·· 18.9	299 56.2	·· 29.3	129 40.7	·· 46.5	301 04.9	·· 20.8	310 57.0	150	· 4 41.8	−149
4	149 54.5	285 21.2	19.8	314 57.4	29.8	144 43.0	46.5	316 07.2	20.8	325 31.0	149	4 56.7	−149
5	164 56.9	300 20.8	20.6	329 58.6	30.3	159 45.3	46.6	331 09.6	20.9	340 04.9	149	5 11.6	−149
6	179 59.4	315 20.3	−14 21.4	344 59.8	− 4 30.8	174 47.6	+ 0 46.7	346 11.9	− 3 20.9	354 38.8	149	− 5 26.5	−148
7	195 01.9	330 19.9	22.3	0 01.0	31.3	189 49.9	46.8	1 14.2	21.0	9 12.7	147	5 41.3	−149
8	210 04.3	345 19.5	23.1	15 02.3	31.8	204 52.2	46.9	16 16.5	21.0	23 46.4	147	5 56.2	−148
9	225 06.8	0 19.1	·· 24.0	30 03.5	·· 32.3	219 54.5	·· 47.0	31 18.9	·· 21.1	38 20.1	147	· 6 11.0	−149
10	240 09.3	15 18.7	24.8	45 04.7	32.8	234 56.8	47.0	46 21.2	21.1	52 53.8	146	6 25.9	−148
11	255 11.7	30 18.2	25.7	60 05.9	33.3	249 59.0	47.1	61 23.5	21.2	67 27.4	145	6 40.7	−149
12	270 14.2	45 17.8	−14 26.5	75 07.2	− 4 33.8	265 01.3	+ 0 47.2	76 25.9	− 3 21.2	82 00.9	144	− 6 55.6	−148
13	285 16.6	60 17.4	27.3	90 08.4	34.3	280 03.6	47.3	91 28.2	21.3	96 34.3	144	7 10.4	−148
14	300 19.1	75 16.9	28.2	105 09.6	34.8	295 05.9	47.4	106 30.5	21.3	111 07.7	143	7 25.2	−148
15	315 21.6	90 16.5	·· 29.0	120 10.8	·· 35.3	310 08.2	·· 47.5	121 32.8	·· 21.3	125 41.0	142	· 7 40.0	−148
16	330 24.0	105 16.1	29.9	135 12.1	35.8	325 10.5	47.6	136 35.2	21.4	140 14.2	142	7 54.8	−148
17	345 26.5	120 15.7	30.7	150 13.3	36.3	340 12.8	47.6	151 37.5	21.4	154 47.4	141	8 09.6	−147
18	0 29.0	135 15.2	−14 31.5	165 14.5	− 4 36.8	355 15.1	+ 0 47.7	166 39.8	− 3 21.5	169 20.5	140	− 8 24.3	−148
19	15 31.4	150 14.8	32.4	180 15.8	37.3	10 17.4	47.8	181 42.2	21.5	183 53.5	139	8 39.1	−147
20	30 33.9	165 14.4	33.2	195 17.0	37.8	25 19.7	47.9	196 44.5	21.6	198 26.4	138	8 53.8	−147
21	45 36.4	180 13.9	·· 34.0	210 18.2	·· 38.3	40 22.0	·· 48.0	211 46.8	·· 21.6	212 59.2	138	· 9 08.5	−147
22	60 38.8	195 13.5	34.9	225 19.4	38.8	55 24.3	48.1	226 49.1	21.7	227 32.0	137	9 23.2	−146
23	75 41.3	210 13.1	35.7	240 20.7	39.3	70 26.6	48.2	241 51.5	21.7	242 04.7	136	9 37.8	−147
0	90 43.8	225 12.6	−14 36.5	255 21.9	− 4 39.8	85 28.9	+ 0 48.2	256 53.8	− 3 21.7	256 37.3	135	− 9 52.5	−146
1	105 46.2	240 12.2	37.4	270 23.1	40.3	100 31.2	48.3	271 56.1	21.8	271 09.8	134	10 07.1	−146
2	120 48.7	255 11.8	38.2	285 24.3	40.8	115 33.5	48.4	286 58.5	21.8	285 42.2	133	10 21.7	−146
3	135 51.1	270 11.3	·· 39.0	300 25.6	·· 41.3	130 35.8	·· 48.5	302 00.8	·· 21.9	300 14.5	133	·10 36.3	−145
4	150 53.6	285 10.9	39.9	315 26.8	41.8	145 38.1	48.6	317 03.1	21.9	314 46.8	131	10 50.8	−145
5	165 56.1	300 10.5	40.7	330 28.0	42.3	160 40.4	48.7	332 05.5	22.0	329 18.9	131	11 05.3	−145
6	180 58.5	315 10.0	−14 41.5	345 29.2	− 4 42.8	175 42.6	+ 0 48.8	347 07.8	− 3 22.0	343 51.0	129	−11 19.8	−145
7	196 01.0	330 09.6	42.4	0 30.5	43.3	190 44.9	48.9	2 10.1	22.1	358 22.9	129	11 34.3	−144
8	211 03.5	345 09.2	43.2	15 31.7	43.8	205 47.2	48.9	17 12.4	22.1	12 54.8	128	11 48.7	−144
9	226 05.9	0 08.7	·· 44.0	30 32.9	·· 44.3	220 49.5	·· 49.0	32 14.8	·· 22.1	27 26.6	126	·12 03.1	−143
10	241 08.4	15 08.3	44.9	45 34.2	44.8	235 51.8	49.1	47 17.1	22.2	41 58.2	126	12 17.4	−143
11	256 10.9	30 07.8	45.7	60 35.4	45.3	250 54.1	49.2	62 19.4	22.2	56 29.8	125	12 31.7	−143
12	271 13.3	45 07.4	−14 46.5	75 36.6	− 4 45.8	265 56.4	+ 0 49.3	77 21.8	− 3 22.3	71 01.3	123	−12 46.0	−142
13	286 15.8	60 07.0	47.4	90 37.8	46.3	280 58.7	49.4	92 24.1	22.3	85 32.6	123	13 00.2	−142
14	301 18.3	75 06.5	48.2	105 39.1	46.8	296 01.0	49.5	107 26.4	22.4	100 03.9	121	13 14.4	−142
15	316 20.7	90 06.1	·· 49.0	120 40.3	·· 47.3	311 03.3	·· 49.6	122 28.8	·· 22.4	114 35.0	121	·13 28.6	−141
16	331 23.2	105 05.6	49.8	135 41.5	47.8	326 05.5	49.6	137 31.1	22.4	129 06.1	119	13 42.7	−140
17	346 25.6	120 05.2	50.7	150 42.8	48.3	341 07.8	49.7	152 33.4	22.5	143 37.0	118	13 56.7	−140
18	1 28.1	135 04.7	−14 51.5	165 44.0	− 4 48.8	356 10.1	+ 0 49.8	167 35.8	− 3 22.5	158 07.8	117	−14 10.7	−140
19	16 30.6	150 04.3	52.3	180 45.2	49.3	11 12.4	49.9	182 38.1	22.6	172 38.5	116	14 24.7	−139
20	31 33.0	165 03.9	53.1	195 46.4	49.8	26 14.7	50.0	197 40.4	22.6	187 09.1	115	14 38.6	−139
21	46 35.5	180 03.4	·· 54.0	210 47.7	·· 50.3	41 17.0	·· 50.1	212 42.8	·· 22.7	201 39.6	114	·14 52.5	−138
22	61 38.0	195 03.0	54.8	225 48.9	50.8	56 19.3	50.2	227 45.1	22.7	216 10.0	112	15 06.3	−137
23	76 40.4	210 02.5	55.6	240 50.1	51.2	71 21.6	50.3	242 47.4	22.7	230 40.2	112	15 20.0	−137
24	91 42.9	225 02.1	−14 56.4	255 51.4	− 4 51.7	86 23.9	+ 0 50.4	257 49.8	− 3 22.8	245 10.4	110	−15 33.7	−136
code	—	− 4	− 8	+ 12	− 5	+ 23	+ 1	+ 23	− 1				

GCT	SUN GHA	SUN Dec.
h	° ′	° ′
0	180 36.4	−23 26.2
1	195 36.0	26.2
2	210 35.7	26.3
3	225 35.4	·· 26.3
4	240 35.1	26.3
5	255 34.8	26.4
6	270 34.5	−23 26.4
7	285 34.2	26.4
8	300 33.9	26.4
9	315 33.6	·· 26.5
10	330 33.3	26.5
11	345 32.9	26.5
12	0 32.6	−23 26.5
13	15 32.3	26.6
14	30 32.0	26.6
15	45 31.7	·· 26.6
16	60 31.4	26.6
17	75 31.1	26.6
18	90 30.8	−23 26.7
19	105 30.5	26.7
20	120 30.1	26.7
21	135 29.8	·· 26.7
22	150 29.5	26.7
23	165 29.2	26.7
0	180 28.9	−23 26.8
1	195 28.6	26.8
2	210 28.3	26.8
3	225 28.0	·· 26.8
4	240 27.7	26.8
5	255 27.3	26.8
6	270 27.0	−23 26.8
7	285 26.7	26.8
8	300 26.4	26.8
9	315 26.1	·· 26.8
10	330 25.8	26.8
11	345 25.5	26.8
12	0 25.2	−23 26.9
13	15 24.8	26.9
14	30 24.5	26.9
15	45 24.2	·· 26.9
16	60 23.9	26.9
17	75 23.6	26.9
18	90 23.3	−23 26.9
19	105 23.0	26.9
20	120 22.7	26.9
21	135 22.4	·· 26.8
22	150 22.0	26.8
23	165 21.7	26.8
0	180 21.4	−23 26.8
1	195 21.1	26.8
2	210 20.8	26.8
3	225 20.5	·· 26.8
4	240 20.2	26.8
5	255 19.9	26.8
6	270 19.5	−23 26.8
7	285 19.2	26.8
8	300 18.9	26.8
9	315 18.6	·· 26.7
10	330 18.3	26.7
11	345 18.0	26.7
12	0 17.7	−23 26.7
13	15 17.4	26.7
14	30 17.0	26.7
15	45 16.7	·· 26.6
16	60 16.4	26.6
17	75 16.1	26.6
18	90 15.8	−23 26.6
19	105 15.5	26.6
20	120 15.2	26.5
21	135 14.9	·· 26.5
22	150 14.5	26.5
23	165 14.2	26.5
24	180 13.9	−23 26.4
code	—	0

No.	STARS SHA	Dec.	Transit Mer. Gr.
	° ′	° ′	h m
1	358 31.4	+28 49.7	18 04
2	358 21.1	+58 53.4	18 05
3	349 42.1	−18 15.0	18 39
4	339 20.0	+59 59.6	19 21
5	336 00.5	−57 29.0	19 34
6	332 24.1	+89 02.7	19 48
7	328 52.8	+23 14.4	20 02
8	315 52.9	−40 29.8	20 54
9	309 46.3	+49 41.8	21 18
10	291 42.1	+16 25.0	22 31
11	281 56.1	− 8 15.2	23 09
12	281 42.3	+45 57.3	23 10
13	279 21.2	+ 6 18.6	23 20
14	279 10.7	+28 34.3	23 20
15	276 32.9	− 1 13.7	23 31
16	271 51.0	+ 7 24.1	23 50
17	264 16.1	−52 40.0	0 24
18	259 14.1	−16 38.8	0 44
19	255 48.5	−28 54.2	0 58
20	245 47.8	+ 5 21.0	1 38
21	244 23.8	+28 08.7	1 43
22	234 36.6	−59 21.0	2 22
23	223 26.3	−43 14.0	3 07
24	221 49.3	−69 30.9	3 13
25	218 41.3	− 8 26.9	3 26
26	208 32.5	+12 12.1	4 06
27	194 47.8	+62 00.3	5 01
28	183 20.7	+14 50.3	5 47
29	174 01.5	−62 49.8	6 24
30	172 52.8	−56 50.4	6 28
31	168 46.7	−59 25.4	6 45
32	167 01.0	+56 12.9	6 52
33	159 30.0	+55 10.2	7 22
34	159 20.1	−10 54.7	7 22
35	153 35.3	+49 32.8	7 45
36	149 02.5	−36 08.0	8 04
37	146 38.0	+19 25.7	8 13
38	140 55.7	−60 38.3	8 36
39	137 18.2	+74 20.7	8 50
40	126 50.4	+26 52.3	9 32
41	120 37.9	−22 29.3	9 57
42	113 23.4	−26 19.7	10 26
43	109 07.4	−68 56.6	10 43
44	103 05.9	−15 40.1	11 07
45	97 25.1	−37 04.4	11 29
46	96 49.7	+12 35.5	11 32
47	91 08.2	+51 29.5	11 55
48	84 45.5	−34 24.7	12 20
49	81 10.7	+38 44.2	12 34
50	76 55.9	−26 21.6	12 51
51	62 53.6	+ 8 44.3	13 47
52	54 32.3	−56 53.7	14 21
53	50 03.5	+45 06.6	14 38
54	34 32.7	+ 9 39.3	15 40
55	28 41.7	−47 11.9	16 04
56	16 14.9	−29 52.8	16 53
57	14 24.5	+14 56.9	17 01

Lat.	Sunrise	Twlt. begins	Moonrise 21	22	23	24
N °	h m	h m	h m	h m	h m	h m
70	■	6 45	25 01	1 01	3 05	5 39
68	■	6 37	24 56	0 56	2 50	5 04
66	10 35	6 31	24 51	0 51	2 38	4 39
64	9 52	6 26	24 48	0 48	2 29	4 20
62	9 24	6 20	24 45	0 45	2 20	4 04
60	9 02	6 16	24 42	0 42	2 13	3 51
58	8 45	6 11	24 40	0 40	2 07	3 40
56	8 30	6 07	24 38	0 38	2 01	3 31
54	8 17	6 03	24 36	0 36	1 56	3 22
52	8 06	5 59	24 34	0 34	1 52	3 15
50	7 56	5 55	24 32	0 32	1 48	3 08
45	7 35	5 48	24 29	0 29	1 39	2 54
40	7 18	5 40	24 26	0 26	1 32	2 42
35	7 04	5 33	24 24	0 24	1 26	2 32
30	6 52	5 25	24 22	0 22	1 21	2 23
20	6 31	5 11	24 18	0 18	1 11	2 08
10	6 12	4 56	24 15	0 15	1 03	1 55
0	5 54	4 39	24 12	0 12	0 56	1 43
10	5 37	4 18	24 09	0 09	0 48	1 31
20	5 18	3 53	24 06	0 06	0 41	1 19
30	4 56	3 18	24 03	0 03	0 32	1 05
35	4 43	2 55	24 01	0 01	0 27	0 56
40	4 28	2 24	23 58	24 21	0 21	0 47
45	4 10	1 36	23 56	24 14	0 14	0 36
50	3 47	////	23 53	24 07	0 07	0 23
52	3 36	////	23 51	24 03	0 03	0 17
54	3 24	////	23 50	23 59	24 10	0 10
56	3 10	////	23 48	23 55	24 03	0 03
58	2 53	////	23 47	23 50	23 55	24 03
60	2 32	////	23 45	23 44	23 45	23 48
S						

Lat.	Sunset	Twlt. ends	Moonset 21	22	23	24
N °	h m	h m	h m	h m	h m	h m
70	■	17 10	11 39	11 13	10 42	9 49
68	■	17 18	11 40	11 21	10 59	10 26
66	13 21	17 24	11 41	11 28	11 13	10 52
64	14 04	17 30	11 42	11 33	11 24	11 13
62	14 33	17 36	11 42	11 38	11 34	11 29
60	14 54	17 40	11 43	11 42	11 42	11 43
58	15 12	17 45	11 43	11 46	11 50	11 55
56	15 27	17 49	11 44	11 50	11 56	12 06
54	15 39	17 53	11 44	11 53	12 02	12 15
52	15 51	17 57	11 45	11 55	12 08	12 23
50	16 00	18 00	11 45	11 58	12 13	12 31
45	16 21	18 08	11 46	12 03	12 23	12 47
40	16 38	18 16	11 47	12 08	12 32	13 00
35	16 52	18 23	11 47	12 12	12 40	13 12
30	17 05	18 31	11 48	12 16	12 46	13 21
20	17 26	18 45	11 48	12 22	12 58	13 39
10	17 45	19 00	11 49	12 27	13 08	13 54
0	18 02	19 17	11 50	12 32	13 18	14 08
10	18 20	19 38	11 51	12 38	13 28	14 22
20	18 39	20 03	11 51	12 43	13 38	14 37
30	19 01	20 38	11 52	12 49	13 50	14 55
35	19 14	21 01	11 53	12 53	13 57	15 05
40	19 29	21 32	11 53	12 57	14 05	15 17
45	19 47	22 20	11 54	13 02	14 14	15 31
50	20 09	////	11 54	13 08	14 25	15 48
52	20 20	////	11 55	13 11	14 31	15 56
54	20 33	////	11 55	13 14	14 36	16 05
56	20 47	////	11 55	13 17	14 43	16 15
58	21 04	////	11 56	13 20	14 50	16 27
60	21 24	////	11 56	13 25	14 58	16 41
S						

GCT	Equation of Time (App.—Mean) 21	22	23
h	m s	m s	m s
0	+ 2 26.1	+ 1 56.2	+ 1 26.3
6	+ 2 18.6	+ 1 48.7	+ 1 18.8
12	+ 2 11.1	+ 1 41.3	+ 1 11.3
18	+ 2 03.7	+ 1 33.8	+ 1 03.8
24	+ 1 56.2	+ 1 26.3	+ 0 56.3

GCT of Transit Meridian of Greenwich

DAY	Moon	Venus	Mars	Jupiter	Saturn
	h m	h m	h m	h m	h m
21	5 40	8 58	7 02	18 23	6 59
22	6 22	8 59	7 00	18 19	6 55
23	7 07	8 59	6 58	18 15	6 51
24	7 55	9 00	6 56	18 12	6 48

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb	Venus	Mars
°	′	′	′
0			
	0.6	0.1	0.1
30			
	0.6	0.1	0.1
45			
	0.6	0.1	0.1
60			
	0.6	0.1	0.0
75			
	0.6	0.0	0.0
90			

Moon's Lower Limb
Add

Alt.	21	22	23
°	′	′	′
0			
	14.2	15.2	16.4
4			
	14.2	15.2	16.4
8			
	14.2	15.2	16.4
12			
	14.2	15.2	16.4
16			
	14.2	15.2	16.4
20			
	14.2	15.2	16.4
24			
	14.3	15.2	16.4
28			
	14.3	15.2	16.3
32			
	14.3	15.2	16.3
36			
	14.4	15.2	16.3
40			
	14.4	15.2	16.3
44			
	14.5	15.3	16.2
48			
	14.5	15.3	16.2
52			
	14.6	15.3	16.2
56			
	14.7	15.3	16.1
60			
	14.7	15.3	16.1
64			
	14.8	15.3	16.0
68			
	14.9	15.4	16.0
72			
	14.9	15.4	15.9
76			
	15.0	15.4	15.9
80			
	15.1	15.4	15.8
84			
	15.2	15.4	15.8
88			
	15.2	15.5	15.8
90			

Add to table, back cover

Moon's Upper Limb
Subtract

Alt.	21	22	23
°	′	′	′
0			
	16.4	15.8	15.0
4			
	16.3	15.8	15.0
8			
	16.3	15.8	15.1
12			
	16.3	15.8	15.1
16			
	16.3	15.8	15.1
20			
	16.3	15.7	15.1
24			
	16.2	15.7	15.1
28			
	16.2	15.7	15.1
32			
	16.2	15.7	15.2
36			
	16.1	15.7	15.2
40			
	16.1	15.7	15.2
44			
	16.0	15.7	15.3
48			
	16.0	15.7	15.3
52			
	15.9	15.6	15.3
56			
	15.8	15.6	15.4
60			
	15.8	15.6	15.4
64			
	15.7	15.6	15.5
68			
	15.6	15.6	15.5
72			
	15.6	15.6	15.5
76			
	15.5	15.5	15.6
80			
	15.4	15.5	15.6
84			
	15.3	15.5	15.7
88			
	15.3	15.5	15.7
90			

Subtract from table, back cover

Last Quarter 21

833190°—50——16

GCT	♈	VENUS −3.7		MARS 1.4		JUPITER −2.1		SATURN 1.0		MOON			
	GHA	GHA	Dec.	GHA	Dec.	GHA	Dec.	GHA	Dec.	GHA	code	Dec.	code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
0	91 42.9	225 02.1	−14 56.4	255 51.4	− 4 51.7	86 23.9	+ 0 50.4	257 49.8	− 3 22.8	245 10.4	110	−15 33.7	−136
1	106 45.4	240 01.6	57.3	270 52.6	52.2	101 26.1	50.4	272 52.1	22.8	259 40.4	109	15 47.3	−136
2	121 47.8	255 01.2	58.1	285 53.8	52.7	116 28.4	50.5	287 54.4	22.9	274 10.3	107	16 00.9	−135
3	136 50.3	270 00.7	·· 58.9	300 55.1	·· 53.2	131 30.7	·· 50.6	302 56.8	·· 22.9	288 40.0	107	·16 14.4	−135
4	151 52.7	285 00.3	14 59.7	315 56.3	53.7	146 33.0	50.7	317 59.1	23.0	303 09.7	105	16 27.9	−133
5	166 55.2	299 59.8	15 00.6	330 57.5	54.2	161 35.3	50.8	333 01.4	23.0	317 39.2	104	16 41.2	−133
6	181 57.7	314 59.4	−15 01.4	345 58.8	− 4 54.7	176 37.6	+ 0 50.9	348 03.8	− 3 23.0	332 08.6	103	−16 54.5	−133
7	197 00.1	329 58.9	02.2	1 00.0	55.2	191 39.8	51.0	3 06.1	23.1	346 37.9	101	17 07.8	−132
8	212 02.6	344 58.5	03.0	16 01.2	55.7	206 42.1	51.1	18 08.4	23.1	1 07.0	100	17 21.0	−130
9	227 05.1	359 58.0	·· 03.8	31 02.4	·· 56.2	221 44.4	·· 51.2	33 10.8	·· 23.2	15 36.0	99	·17 34.0	−131
10	242 07.5	14 57.6	04.7	46 03.7	56.7	236 46.7	51.3	48 13.1	23.2	30 04.9	98	17 47.1	−129
11	257 10.0	29 57.1	05.5	61 04.9	57.2	251 49.0	51.4	63 15.4	23.3	44 33.7	96	18 00.0	−129
12	272 12.5	44 56.7	−15 06.3	76 06.1	− 4 57.7	266 51.3	+ 0 51.4	78 17.8	− 3 23.3	59 02.3	95	−18 12.9	−128
13	287 14.9	59 56.2	07.1	91 07.4	58.2	281 53.5	51.5	93 20.1	23.3	73 30.8	93	18 25.7	−127
14	302 17.4	74 55.8	07.9	106 08.6	58.7	296 55.8	51.6	108 22.4	23.4	87 59.1	92	18 38.4	−126
15	317 19.9	89 55.3	·· 08.7	121 09.8	·· 59.2	311 58.1	·· 51.7	123 24.8	·· 23.4	102 27.3	91	·18 51.0	−125
16	332 22.3	104 54.8	09.6	136 11.1	4 59.7	327 00.4	51.8	138 27.1	23.5	116 55.4	90	19 03.5	−125
17	347 24.8	119 54.4	10.4	151 12.3	5 00.2	342 02.7	51.9	153 29.5	23.5	131 23.4	88	19 16.0	−123
18	2 27.2	134 53.9	−15 11.2	166 13.5	− 5 00.7	357 05.0	+ 0 52.0	168 31.8	− 3 23.6	145 51.2	86	−19 28.3	−123
19	17 29.7	149 53.5	12.0	181 14.8	01.2	12 07.2	52.1	183 34.1	23.6	160 18.8	86	19 40.6	−121
20	32 32.2	164 53.0	12.8	196 16.0	01.6	27 09.5	52.2	198 36.5	23.6	174 46.4	84	19 52.7	−121
21	47 34.6	179 52.6	·· 13.6	211 17.2	·· 02.1	42 11.8	·· 52.3	213 38.8	·· 23.7	189 13.8	82	·20 04.8	−120
22	62 37.1	194 52.1	14.4	226 18.5	02.6	57 14.1	52.4	228 41.1	23.7	203 41.0	81	20 16.8	−118
23	77 39.6	209 51.6	15.2	241 19.7	03.1	72 16.4	52.5	243 43.5	23.8	218 08.1	80	20 28.6	−118
0	92 42.0	224 51.2	−15 16.1	256 20.9	− 5 03.6	87 18.6	+ 0 52.5	258 45.8	− 3 23.8	232 35.1	78	−20 40.4	−117
1	107 44.5	239 50.7	16.9	271 22.2	04.1	102 20.9	52.6	273 48.1	23.8	247 01.9	77	20 52.1	−115
2	122 47.0	254 50.2	17.7	286 23.4	04.6	117 23.2	52.7	288 50.5	23.9	261 28.6	75	21 03.6	−115
3	137 49.4	269 49.8	·· 18.5	301 24.6	·· 05.1	132 25.5	·· 52.8	303 52.8	·· 23.9	275 55.1	74	·21 15.1	−113
4	152 51.9	284 49.3	19.3	316 25.9	05.6	147 27.7	52.9	318 55.2	24.0	290 21.5	73	21 26.4	−112
5	167 54.4	299 48.9	20.1	331 27.1	06.1	162 30.0	53.0	333 57.5	24.0	304 47.8	71	21 37.6	−111
6	182 56.8	314 48.4	−15 20.9	346 28.3	− 5 06.6	177 32.3	+ 0 53.1	348 59.8	− 3 24.0	319 13.9	70	−21 48.7	−110
7	197 59.3	329 47.9	21.7	1 29.6	07.1	192 34.6	53.2	4 02.2	24.1	333 39.9	68	21 59.7	−109
8	213 01.7	344 47.5	22.5	16 30.8	07.6	207 36.9	53.3	19 04.5	24.1	348 05.7	66	22 10.6	−107
9	228 04.2	359 47.0	·· 23.3	31 32.1	·· 08.1	222 39.1	·· 53.4	34 06.8	·· 24.2	2 31.3	66	·22 21.3	−106
10	243 06.7	14 46.5	24.2	46 33.3	08.6	237 41.4	53.5	49 09.2	24.2	16 56.9	64	22 31.9	−105
11	258 09.1	29 46.1	25.0	61 34.5	09.0	252 43.7	53.6	64 11.5	24.3	31 22.3	62	22 42.4	−104
12	273 11.6	44 45.6	−15 25.8	76 35.8	− 5 09.5	267 46.0	+ 0 53.7	79 13.9	− 3 24.3	45 47.5	61	−22 52.8	−102
13	288 14.1	59 45.1	26.6	91 37.0	10.0	282 48.2	53.8	94 16.2	24.3	60 12.6	59	23 03.0	−101
14	303 16.5	74 44.7	27.4	106 38.2	10.5	297 50.5	53.8	109 18.5	24.4	74 37.5	58	23 13.1	−100
15	318 19.0	89 44.2	·· 28.2	121 39.5	·· 11.0	312 52.8	·· 53.9	124 20.9	·· 24.4	89 02.3	57	·23 23.1	− 98
16	333 21.5	104 43.7	29.0	136 40.7	11.5	327 55.1	54.0	139 23.2	24.5	103 27.0	55	23 32.9	− 97
17	348 23.9	119 43.3	29.8	151 41.9	12.0	342 57.3	54.1	154 25.6	24.5	117 51.5	54	23 42.6	− 95
18	3 26.4	134 42.8	−15 30.6	166 43.2	− 5 12.5	357 59.6	+ 0 54.2	169 27.9	− 3 24.5	132 15.9	52	−23 52.1	− 94
19	18 28.9	149 42.3	31.4	181 44.4	13.0	13 01.9	54.3	184 30.2	24.6	146 40.1	51	24 01.5	− 93
20	33 31.3	164 41.8	32.2	196 45.7	13.5	28 04.2	54.4	199 32.6	24.6	161 04.2	50	24 10.8	− 91
21	48 33.8	179 41.4	·· 33.0	211 46.9	·· 14.0	43 06.4	·· 54.5	214 34.9	·· 24.7	175 28.2	48	·24 19.9	− 89
22	63 36.2	194 40.9	33.8	226 48.1	14.4	58 08.7	54.6	229 37.3	24.7	189 52.0	47	24 28.8	− 88
23	78 38.7	209 40.4	34.6	241 49.4	14.9	73 11.0	54.7	244 39.6	24.7	204 15.7	45	24 37.6	− 86
0	93 41.2	224 39.9	−15 35.4	256 50.6	− 5 15.4	88 13.3	+ 0 54.8	259 41.9	− 3 24.8	218 39.2	44	−24 46.2	− 85
1	108 43.6	239 39.5	36.2	271 51.8	15.9	103 15.5	54.9	274 44.3	24.8	233 02.6	42	24 54.7	− 83
2	123 46.1	254 39.0	37.0	286 53.1	16.4	118 17.8	55.0	289 46.6	24.9	247 25.8	41	25 03.0	− 82
3	138 48.6	269 38.5	·· 37.8	301 54.3	·· 16.9	133 20.1	·· 55.1	304 49.0	·· 24.9	261 48.9	40	·25 11.2	− 80
4	153 51.0	284 38.0	38.6	316 55.6	17.4	148 22.3	55.2	319 51.3	24.9	276 11.9	39	25 19.2	− 78
5	168 53.5	299 37.6	39.4	331 56.8	17.9	163 24.6	55.3	334 53.6	25.0	290 34.8	37	25 27.0	− 77
6	183 56.0	314 37.1	−15 40.2	346 58.0	− 5 18.4	178 26.9	+ 0 55.4	349 56.0	− 3 25.0	304 57.5	36	−25 34.7	− 74
7	198 58.4	329 36.6	41.0	1 59.3	18.9	193 29.1	55.5	4 58.3	25.0	319 20.1	35	25 42.1	− 73
8	214 00.9	344 36.1	41.8	17 00.5	19.3	208 31.4	55.6	20 00.7	25.1	333 42.6	33	25 49.4	− 72
9	229 03.3	359 35.7	·· 42.6	32 01.7	·· 19.8	223 33.7	·· 55.7	35 03.0	·· 25.1	348 04.9	32	·25 56.6	− 69
10	244 05.8	14 35.2	43.4	47 03.0	20.3	238 36.0	55.8	50 05.3	25.2	2 27.1	31	26 03.5	− 68
11	259 08.3	29 34.7	44.2	62 04.2	20.8	253 38.2	55.9	65 07.7	25.2	16 49.2	30	26 10.3	− 66
12	274 10.7	44 34.2	−15 44.9	77 05.5	− 5 21.3	268 40.5	+ 0 56.0	80 10.0	− 3 25.2	31 11.2	28	−26 16.9	− 64
13	289 13.2	59 33.7	45.7	92 06.7	21.8	283 42.8	56.1	95 12.4	25.3	45 33.0	27	26 23.3	− 63
14	304 15.7	74 33.2	46.5	107 07.9	22.3	298 45.0	56.1	110 14.7	25.3	59 54.7	26	26 29.6	− 60
15	319 18.1	89 32.8	·· 47.3	122 09.2	·· 22.8	313 47.3	·· 56.2	125 17.1	·· 25.4	74 16.3	25	·26 35.6	− 59
16	334 20.6	104 32.3	48.1	137 10.4	23.3	328 49.6	56.3	140 19.4	25.4	88 37.8	24	26 41.5	− 56
17	349 23.1	119 31.8	48.9	152 11.7	23.7	343 51.8	56.4	155 21.7	25.4	102 59.2	23	26 47.1	− 55
18	4 25.5	134 31.3	−15 49.7	167 12.9	− 5 24.2	358 54.1	+ 0 56.5	170 24.1	− 3 25.5	117 20.5	22	−26 52.6	− 53
19	19 28.0	149 30.8	50.5	182 14.1	24.7	13 56.4	56.6	185 26.4	25.5	131 41.7	20	26 57.9	− 51
20	34 30.5	164 30.3	51.3	197 15.4	25.2	28 58.6	56.7	200 28.8	25.6	146 02.7	20	27 03.0	− 48
21	49 32.9	179 29.9	·· 52.1	212 16.6	·· 25.7	44 00.9	·· 56.8	215 31.1	·· 25.6	160 23.7	19	·27 07.8	− 47
22	64 35.4	194 29.4	52.8	227 17.9	26.2	59 03.2	56.9	230 33.5	25.6	174 44.6	17	27 12.5	− 45
23	79 37.8	209 28.9	53.6	242 19.1	26.7	74 05.4	57.0	245 35.8	25.7	189 05.3	17	27 17.0	− 43
24	94 40.3	224 28.4	−15 54.4	257 20.4	− 5 27.2	89 07.7	+ 0 57.1	260 38.2	− 3 25.7	203 26.0	16	−27 21.3	− 40
code	—	− 5	− 8	+ 12	− 5	+ 22	+ 1	+ 23	0				

GCT	SUN GHA	SUN Dec.
h	° ′	° ′
0	180 13.9	−23 26.4
1	195 13.6	26.4
2	210 13.3	26.4
3	225 13.0	·· 26.4
4	240 12.7	26.3
5	255 12.4	26.3
6	270 12.0	−23 26.3
7	285 11.7	26.2
8	300 11.4	26.2
9	315 11.1	·· 26.2
10	330 10.8	26.1
11	345 10.5	26.1
12	0 10.2	−23 26.1
13	15 09.9	26.0
14	30 09.6	26.0
15	45 09.2	·· 26.0
16	60 08.9	25.9
17	75 08.6	25.9
18	90 08.3	−23 25.8
19	105 08.0	25.8
20	120 07.7	25.8
21	135 07.4	·· 25.7
22	150 07.1	25.7
23	165 06.7	25.6
0	180 06.4	−23 25.6
1	195 06.1	25.5
2	210 05.8	25.5
3	225 05.5	·· 25.4
4	240 05.2	25.4
5	255 04.9	25.3
6	270 04.6	−23 25.3
7	285 04.2	25.2
8	300 03.9	25.2
9	315 03.6	·· 25.1
10	330 03.3	25.1
11	345 03.0	25.0
12	0 02.7	−23 25.0
13	15 02.4	24.9
14	30 02.1	24.9
15	45 01.8	·· 24.8
16	60 01.4	24.7
17	75 01.1	24.7
18	90 00.8	−23 24.6
19	105 00.5	24.6
20	120 00.2	24.5
21	134 59.9	·· 24.4
22	149 59.6	24.4
23	164 59.3	24.3
0	179 58.9	−23 24.2
1	194 58.6	24.2
2	209 58.3	24.1
3	224 58.0	·· 24.0
4	239 57.7	24.0
5	254 57.4	23.9
6	269 57.1	−23 23.8
7	284 56.8	23.8
8	299 56.5	23.7
9	314 56.1	·· 23.6
10	329 55.8	23.6
11	344 55.5	23.5
12	359 55.2	−23 23.4
13	14 54.9	23.3
14	29 54.6	23.2
15	44 54.3	·· 23.2
16	59 54.0	23.1
17	74 53.7	23.0
18	89 53.3	−23 22.9
19	104 53.0	22.9
20	119 52.7	22.8
21	134 52.4	·· 22.7
22	149 52.1	22.6
23	164 51.8	22.5
24	179 51.5	−23 22.4
code	—	+ 1

STARS No.	SHA	Dec.	Transit Mer. Gr.
	° ′	° ′	h m
1	358 31.5	+28 49.7	17 52
2	358 21.1	+58 53.4	17 53
3	349 42.1	−18 15.0	18 27
4	339 20.0	+59 59.6	19 09
5	336 00.6	−57 29.0	19 22
6	332 24.9	+89 02.7	19 36
7	328 52.8	+23 14.4	19 50
8	315 52.9	−40 29.8	20 42
9	309 46.3	+49 41.8	21 07
10	291 42.1	+16 25.0	22 19
11	281 56.1	− 8 15.2	22 58
12	281 42.3	+45 57.3	22 59
13	279 21.2	+ 6 18.6	23 08
14	279 10.7	+28 34.3	23 09
15	276 32.9	− 1 13.7	23 19
16	271 51.0	+ 7 24.1	23 38
17	264 16.1	−52 40.0	0 12
18	259 14.1	−16 38.8	0 32
19	255 48.5	−28 54.2	0 46
20	245 47.7	+ 5 21.0	1 26
21	244 23.8	+28 08.7	1 31
22	234 36.6	−59 21.0	2 10
23	223 26.3	−43 14.1	2 55
24	221 49.3	−69 30.9	3 01
25	218 41.3	− 8 26.9	3 14
26	208 32.4	+12 12.1	3 54
27	194 47.7	+62 00.3	4 49
28	183 20.7	+14 50.3	5 35
29	174 01.4	−62 49.8	6 12
30	172 52.8	−56 50.4	6 17
31	168 46.7	−59 25.4	6 33
32	167 01.0	+56 12.9	6 40
33	159 30.0	+55 10.2	7 10
34	159 20.1	−10 54.7	7 11
35	153 35.2	+49 32.8	7 34
36	149 02.4	−36 08.0	7 52
37	146 38.0	+19 25.7	8 01
38	140 55.6	−60 38.3	8 24
39	137 18.2	+74 20.7	8 39
40	126 50.4	+26 52.3	9 20
41	120 37.9	−22 29.3	9 45
42	113 23.3	−26 19.7	10 14
43	109 07.3	−68 56.6	10 31
44	103 05.9	−15 40.1	10 55
45	97 25.1	−37 04.3	11 18
46	96 49.7	+12 35.5	11 20
47	91 08.2	+51 29.5	11 43
48	84 45.5	−34 24.7	12 08
49	81 10.7	+38 44.2	12 22
50	76 55.9	−26 21.6	12 39
51	62 53.6	+ 8 44.3	13 35
52	54 32.3	−56 53.7	14 09
53	50 03.5	+45 06.6	14 27
54	34 32.7	+ 9 39.2	15 28
55	28 41.8	−47 11.9	15 52
56	16 14.9	−29 52.8	16 41
57	14 24.5	+14 56.9	16 49

Lat.	Sunrise	Twlt. begins	Moonrise 24	Moonrise 25	Moonrise 26	Moonrise 27
N °	h m	h m	h m	h m	h m	h m
70	■	6 46	5 39	■	■	■
68	■	6 39	5 04	■	■	■
66	10 36	6 33	4 39	7 11	■	■
64	9 53	6 27	4 20	6 29	■	■
62	9 25	6 22	4 04	6 01	8 12	■
60	9 03	6 17	3 51	5 39	7 34	9 20
58	8 46	6 13	3 40	5 22	7 07	8 43
56	8 31	6 09	3 31	5 07	6 46	8 16
54	8 18	6 04	3 22	4 54	6 28	7 55
52	8 07	6 01	3 15	4 43	6 14	7 38
50	7 57	5 57	3 08	4 33	6 01	7 23
45	7 37	5 49	2 54	4 13	5 34	6 53
40	7 20	5 41	2 42	3 56	5 14	6 29
35	7 06	5 34	2 32	3 42	4 56	6 10
30	6 53	5 27	2 23	3 30	4 42	5 53
20	6 32	5 13	2 08	3 10	4 16	5 25
10	6 14	4 58	1 55	2 52	3 55	5 02
0	5 56	4 41	1 43	2 36	3 35	4 39
10	5 38	4 20	1 31	2 20	3 15	4 17
20	5 19	3 55	1 19	2 03	2 54	3 54
30	4 57	3 20	1 05	1 43	2 30	3 26
35	4 44	2 57	0 56	1 32	2 15	3 10
40	4 29	2 26	0 47	1 19	1 59	2 51
45	4 11	1 38	0 36	1 03	1 39	2 28
50	3 49	////	0 23	0 45	1 15	2 00
52	3 38	////	0 17	0 36	1 04	1 46
54	3 26	////	0 10	0 26	0 50	1 29
56	3 11	////	0 03	0 15	0 35	1 10
58	2 54	////	24 03	0 03	0 17	0 47
60	2 34	////	23 48	23 56	24 15	0 15
S						

Lat.	Sunset	Twlt. ends	Moonset 24	Moonset 25	Moonset 26	Moonset 27
N °	h m	h m	h m	h m	h m	h m
70	■	17 12	9 49	■	■	■
68	■	17 19	10 26	■	■	■
66	13 24	17 27	10 52	10 12	■	■
64	14 06	17 32	11 13	10 55	■	■
62	14 35	17 38	11 29	11 25	11 18	■
60	14 56	17 42	11 43	11 47	11 57	12 28
58	15 14	17 47	11 55	12 05	12 25	13 06
56	15 29	17 51	12 06	12 21	12 46	13 32
54	15 41	17 55	12 15	12 34	13 04	13 53
52	15 52	17 58	12 23	12 46	13 19	14 11
50	16 02	18 02	12 31	12 56	13 32	14 26
45	16 23	18 10	12 47	13 18	14 00	14 56
40	16 39	18 17	13 00	13 36	14 21	15 20
35	16 54	18 25	13 12	13 50	14 39	15 39
30	17 06	18 32	13 21	14 03	14 55	15 56
20	17 28	18 47	13 39	14 26	15 21	16 24
10	17 46	19 01	13 54	14 45	15 44	16 49
0	18 04	19 19	14 08	15 03	16 05	17 11
10	18 21	19 39	14 22	15 22	16 26	17 34
20	18 40	20 04	14 37	15 41	16 49	17 58
30	19 02	20 39	14 55	16 04	17 16	18 26
35	19 15	21 02	15 05	16 17	17 31	18 43
40	19 30	21 33	15 17	16 33	17 50	19 02
45	19 48	22 21	15 31	16 51	18 12	19 25
50	20 11	////	15 48	17 14	18 40	19 55
52	20 22	////	15 56	17 26	18 54	20 10
54	20 34	////	16 05	17 38	19 10	20 27
56	20 48	////	16 15	17 53	19 29	20 48
58	21 05	////	16 27	18 10	19 52	21 14
60	21 25	////	16 41	18 31	20 22	21 49
S						

GCT	Equation of Time (App.—Mean) 24	25	26
h	m s	m s	m s
0	+ 0 56.3	+ 0 26.4	− 0 03.6
6	+ 0 48.8	+ 0 18.9	− 0 11.1
12	+ 0 41.3	+ 0 11.4	− 0 18.5
18	+ 0 33.8	+ 0 03.9	− 0 26.0
24	+ 0 26.4	− 0 03.6	− 0 33.5

GCT of Transit Meridian of Greenwich

DAY	Moon	Venus	Mars	Jupiter	Saturn
	h m	h m	h m	h m	h m
24	7 55	9 00	6 56	18 12	6 48
25	8 50	9 01	6 54	18 08	6 44
26	9 50	9 02	6 52	18 04	6 40
27	10 55	9 02	6 50	18 01	6 36

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb	Venus	Mars
°	′	′	′
0			
	0.6	0.1	0.1
30			
	0.6	0.1	0.1
45			
	0.6	0.1	0.1
60			
	0.6	0.1	0.0
75			
	0.6	0.0	0.0
90			

Moon's Lower Limb *Add*

Alt.	24	25	26
°	′	′	′
0	17.6	18.9	19.9
4	17.6	18.8	19.9
8	17.6	18.8	19.8
12	17.5	18.8	19.8
16	17.5	18.7	19.7
20	17.5	18.7	19.6
24	17.4	18.6	19.5
28	17.4	18.5	19.4
32	17.3	18.4	19.3
36	17.2	18.3	19.2
40	17.2	18.2	19.0
44	17.1	18.1	18.8
48	17.0	17.9	18.7
52	16.9	17.8	18.5
56	16.8	17.6	18.3
60	16.7	17.5	18.1
64	16.6	17.3	17.9
68	16.5	17.1	17.6
72	16.4	17.0	17.4
76	16.3	16.8	17.2
80	16.2	16.6	17.0
84	16.1	16.4	16.7
88	16.0	16.3	16.5
90			

Add to table, back cover

Moon's Upper Limb *Subtract*

Alt.	24	25	26
°	′	′	′
0	14.4	13.7	13.1
4	14.4	13.7	13.1
8	14.4	13.7	13.1
12	14.4	13.7	13.2
16	14.5	13.8	13.2
20	14.5	13.8	13.3
24	14.5	13.9	13.4
28	14.6	14.0	13.5
32	14.7	14.1	13.7
36	14.7	14.2	13.8
40	14.8	14.3	13.9
44	14.9	14.5	14.1
48	15.0	14.6	14.3
52	15.0	14.7	14.5
56	15.1	14.9	14.7
60	15.2	15.0	14.9
64	15.3	15.2	15.1
68	15.4	15.4	15.3
72	15.5	15.5	15.5
76	15.7	15.7	15.8
80	15.8	15.9	16.0
84	15.9	16.1	16.2
88	16.0	16.2	16.4
90			

Subtract from table, back cover

Christmas Day 25

GCT	♈	VENUS −3.6		MARS 1.3		JUPITER −2.0		SATURN 1.0		MOON			
	GHA	GHA	Dec.	GHA	Dec.	GHA	Dec.	GHA	Dec.	GHA	code	Dec.	code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
0	94 40.3	224 28.4	−15 54.4	257 20.4	− 5 27.2	89 07.7	+ 0 57.1	260 38.2	− 3 25.7	203 26.0	16	−27 21.3	− 40
1	109 42.8	239 27.9	55.2	272 21.6	27.6	104 10.0	57.2	275 40.5	25.7	217 46.6	15	27 25.3	− 39
2	124 45.2	254 27.4	56.0	287 22.8	28.1	119 12.2	57.3	290 42.8	25.8	232 07.1	14	27 29.2	− 37
3	139 47.7	269 26.9	·· 56.8	302 24.1	·· 28.6	134 14.5	·· 57.4	305 45.2	·· 25.8	246 27.5	13	·27 32.9	− 34
4	154 50.2	284 26.4	57.6	317 25.3	29.1	149 16.8	57.5	320 47.5	25.9	260 47.8	13	27 36.3	− 33
5	169 52.6	299 25.9	58.3	332 26.6	29.6	164 19.0	57.6	335 49.9	25.9	275 08.1	12	27 39.6	− 30
6	184 55.1	314 25.5	−15 59.1	347 27.8	− 5 30.1	179 21.3	+ 0 57.7	350 52.2	− 3 25.9	289 28.3	11	−27 42.6	− 28
7	199 57.6	329 25.0	15 59.9	2 29.0	30.6	194 23.5	57.8	5 54.6	26.0	303 48.4	10	27 45.4	− 26
8	215 00.0	344 24.5	16 00.7	17 30.3	31.1	209 25.8	57.9	20 56.9	26.0	318 08.4	10	27 48.0	− 24
9	230 02.5	359 24.0	·· 01.5	32 31.5	·· 31.5	224 28.1	·· 58.0	35 59.3	·· 26.0	332 28.4	9	·27 50.4	− 22
10	245 05.0	14 23.5	02.3	47 32.8	32.0	239 30.3	58.1	51 01.6	26.1	346 48.3	9	27 52.6	− 19
11	260 07.4	29 23.0	03.0	62 34.0	32.5	254 32.6	58.2	66 04.0	26.1	1 08.2	8	27 54.5	− 18
12	275 09.9	44 22.5	−16 03.8	77 35.3	− 5 33.0	269 34.9	+ 0 58.3	81 06.3	− 3 26.2	15 28.0	7	−27 56.3	− 15
13	290 12.3	59 22.0	04.6	92 36.5	33.5	284 37.1	58.4	96 08.6	26.2	29 47.7	7	27 57.8	− 13
14	305 14.8	74 21.5	05.4	107 37.8	34.0	299 39.4	58.5	111 11.0	26.2	44 07.4	7	27 59.1	− 11
15	320 17.3	89 21.0	·· 06.1	122 39.0	·· 34.4	314 41.6	·· 58.6	126 13.3	·· 26.3	58 27.1	6	·28 00.2	− 8
16	335 19.7	104 20.5	06.9	137 40.2	34.9	329 43.9	58.7	141 15.7	26.3	72 46.7	6	28 01.0	− 7
17	350 22.2	119 20.0	07.7	152 41.5	35.4	344 46.2	58.8	156 18.0	26.3	87 06.3	5	28 01.7	− 4
18	5 24.7	134 19.5	−16 08.5	167 42.7	− 5 35.9	359 48.4	+ 0 58.9	171 20.4	− 3 26.4	101 25.8	5	−28 02.1	− 2
19	20 27.1	149 19.0	09.3	182 44.0	36.4	14 50.7	59.0	186 22.7	26.4	115 45.3	5	28 02.3	+ 1
20	35 29.6	164 18.5	10.0	197 45.2	36.9	29 52.9	59.1	201 25.1	26.5	130 04.8	5	28 02.2	+ 2
21	50 32.1	179 18.0	·· 10.8	212 46.5	·· 37.4	44 55.2	·· 59.2	216 27.4	·· 26.5	144 24.3	5	·28 02.0	+ 5
22	65 34.5	194 17.5	11.6	227 47.7	37.8	59 57.5	59.3	231 29.8	26.5	158 43.8	4	28 01.5	+ 7
23	80 37.0	209 17.0	12.3	242 49.0	38.3	74 59.7	59.4	246 32.1	26.6	173 03.2	4	28 00.8	+ 9
0	95 39.5	224 16.5	−16 13.1	257 50.2	− 5 38.8	90 02.0	+ 0 59.5	261 34.5	− 3 26.6	187 22.6	5	−27 59.9	+ 12
1	110 41.9	239 16.0	13.9	272 51.4	39.3	105 04.2	59.6	276 36.8	26.6	201 42.1	4	27 58.7	+ 13
2	125 44.4	254 15.5	14.7	287 52.7	39.8	120 06.5	59.7	291 39.2	26.7	216 01.5	4	27 57.4	+ 16
3	140 46.8	269 15.0	·· 15.4	302 53.9	·· 40.3	135 08.7	·· 59.8	306 41.5	·· 26.7	230 20.9	5	·27 55.8	+ 19
4	155 49.3	284 14.5	16.2	317 55.2	40.7	150 11.0	0 59.9	321 43.9	26.7	244 40.4	4	27 53.9	+ 20
5	170 51.8	299 14.0	17.0	332 56.4	41.2	165 13.3	1 00.0	336 46.2	26.8	258 59.8	4	27 51.9	+ 23
6	185 54.2	314 13.5	−16 17.7	347 57.7	− 5 41.7	180 15.5	+ 1 00.1	351 48.6	− 3 26.8	273 19.2	5	−27 49.6	+ 25
7	200 56.7	329 13.0	18.5	2 58.9	42.2	195 17.8	00.2	6 50.9	26.9	287 38.7	5	27 47.1	+ 27
8	215 59.2	344 12.5	19.3	18 00.2	42.7	210 20.0	00.3	21 53.3	26.9	301 58.2	5	27 44.4	+ 29
9	231 01.6	359 12.0	·· 20.1	33 01.4	·· 43.2	225 22.3	·· 00.4	36 55.6	·· 26.9	316 17.7	6	·27 41.5	+ 32
10	246 04.1	14 11.5	20.8	48 02.7	43.6	240 24.5	00.5	51 58.0	27.0	330 37.3	6	27 38.3	+ 34
11	261 06.6	29 11.0	21.6	63 03.9	44.1	255 26.8	00.7	67 00.3	27.0	344 56.9	6	27 34.9	+ 36
12	276 09.0	44 10.5	−16 22.4	78 05.1	− 5 44.6	270 29.1	+ 1 00.8	82 02.7	− 3 27.0	359 16.5	6	−27 31.3	+ 38
13	291 11.5	59 09.9	23.1	93 06.4	45.1	285 31.3	00.9	97 05.0	27.1	13 36.1	7	27 27.5	+ 40
14	306 14.0	74 09.4	23.9	108 07.6	45.6	300 33.6	01.0	112 07.4	27.1	27 55.8	8	27 23.5	+ 43
15	321 16.4	89 08.9	·· 24.6	123 08.9	·· 46.1	315 35.8	·· 01.1	127 09.7	·· 27.1	42 15.6	7	·27 19.2	+ 45
16	336 18.9	104 08.4	25.4	138 10.1	46.5	330 38.1	01.2	142 12.1	27.2	56 35.3	9	27 14.7	+ 47
17	351 21.3	119 07.9	26.2	153 11.4	47.0	345 40.3	01.3	157 14.4	27.2	70 55.2	9	27 10.0	+ 49
18	6 23.8	134 07.4	−16 26.9	168 12.6	− 5 47.5	0 42.6	+ 1 01.4	172 16.8	− 3 27.2	85 15.1	10	−27 05.1	+ 51
19	21 26.3	149 06.9	27.7	183 13.9	48.0	15 44.8	01.5	187 19.1	27.3	99 35.1	10	27 00.0	+ 53
20	36 28.7	164 06.4	28.5	198 15.1	48.5	30 47.1	01.6	202 21.5	27.3	113 55.1	11	26 54.7	+ 56
21	51 31.2	179 05.9	·· 29.2	213 16.4	·· 48.9	45 49.3	·· 01.7	217 23.8	·· 27.3	128 15.2	11	·26 49.1	+ 57
22	66 33.7	194 05.3	30.0	228 17.6	49.4	60 51.6	01.8	232 26.2	27.4	142 35.3	13	26 43.4	+ 60
23	81 36.1	209 04.8	30.7	243 18.9	49.9	75 53.8	01.9	247 28.5	27.4	156 55.6	13	26 37.4	+ 62
0	96 38.6	224 04.3	−16 31.5	258 20.1	− 5 50.4	90 56.1	+ 1 02.0	262 30.9	− 3 27.5	171 15.9	13	−26 31.2	+ 64
1	111 41.1	239 03.8	32.3	273 21.4	50.9	105 58.3	02.1	277 33.2	27.5	185 36.2	15	26 24.8	+ 65
2	126 43.5	254 03.3	33.0	288 22.6	51.3	121 00.6	02.2	292 35.6	27.5	199 56.7	16	26 18.3	+ 68
3	141 46.0	269 02.8	·· 33.8	303 23.9	·· 51.8	136 02.8	·· 02.3	307 37.9	·· 27.6	214 17.3	16	·26 11.5	+ 70
4	156 48.4	284 02.2	34.5	318 25.1	52.3	151 05.1	02.4	322 40.3	27.6	228 37.9	17	26 04.5	+ 72
5	171 50.9	299 01.7	35.3	333 26.4	52.8	166 07.3	02.5	337 42.6	27.6	242 58.6	18	25 57.3	+ 74
6	186 53.4	314 01.2	−16 36.0	348 27.6	− 5 53.3	181 09.6	+ 1 02.6	352 45.0	− 3 27.7	257 19.4	20	−25 49.9	+ 76
7	201 55.8	329 00.7	36.8	3 28.9	53.7	196 11.8	02.7	7 47.3	27.7	271 40.4	20	25 42.3	+ 78
8	216 58.3	344 00.2	37.5	18 30.1	54.2	211 14.1	02.8	22 49.7	27.7	286 01.4	21	25 34.5	+ 79
9	232 00.8	358 59.6	·· 38.3	33 31.4	·· 54.7	226 16.3	·· 02.9	37 52.0	·· 27.8	300 22.5	22	·25 26.6	+ 82
10	247 03.2	13 59.1	39.1	48 32.6	55.2	241 18.6	03.0	52 54.4	27.8	314 43.7	23	25 18.4	+ 84
11	262 05.7	28 58.6	39.8	63 33.9	55.7	256 20.8	03.2	67 56.7	27.8	329 05.0	24	25 10.0	+ 85
12	277 08.2	43 58.1	−16 40.6	78 35.1	− 5 56.1	271 23.1	+ 1 03.3	82 59.1	− 3 27.9	343 26.4	26	−25 01.5	+ 87
13	292 10.6	58 57.6	41.3	93 36.4	56.6	286 25.3	03.4	98 01.5	27.9	357 48.0	26	24 52.8	+ 89
14	307 13.1	73 57.0	42.1	108 37.6	57.1	301 27.6	03.5	113 03.8	27.9	12 09.6	27	24 43.9	+ 91
15	322 15.6	88 56.5	·· 42.8	123 38.9	·· 57.6	316 29.8	·· 03.6	128 06.2	·· 28.0	26 31.3	29	·24 34.8	+ 93
16	337 18.0	103 56.0	43.6	138 40.1	58.1	331 32.1	03.7	143 08.5	28.0	40 53.2	30	24 25.5	+ 94
17	352 20.5	118 55.5	44.3	153 41.4	58.5	346 34.3	03.8	158 10.9	28.0	55 15.2	31	24 16.1	+ 97
18	7 22.9	133 54.9	−16 45.1	168 42.6	− 5 59.0	1 36.6	+ 1 03.9	173 13.2	− 3 28.1	69 37.3	32	−24 06.4	+ 98
19	22 25.4	148 54.4	45.8	183 43.9	5 59.5	16 38.8	04.0	188 15.6	28.1	83 59.5	33	23 56.6	+ 99
20	37 27.9	163 53.9	46.5	198 45.2	6 00.0	31 41.1	04.1	203 17.9	28.1	98 21.8	35	23 46.7	+102
21	52 30.3	178 53.4	·· 47.3	213 46.4	·· 00.4	46 43.3	·· 04.2	218 20.3	·· 28.2	112 44.3	36	·23 36.5	+103
22	67 32.8	193 52.8	48.0	228 47.7	00.9	61 45.5	04.3	233 22.6	28.2	127 06.9	37	23 26.2	+104
23	82 35.3	208 52.3	48.8	243 48.9	01.4	76 47.8	04.4	248 25.0	28.2	141 29.6	38	23 15.8	+106
24	97 37.7	223 51.8	−16 49.5	258 50.2	− 6 01.9	91 50.0	+ 1 04.5	263 27.4	− 3 28.3	155 52.4	39	−23 05.2	+108
code	—	− 6	− 7	+ 13	− 5	+ 22	+ 1	+ 23	− 1				

GCT	SUN GHA	SUN Dec.
h	° ′	° ′
0	179 51.5	−23 22.4
1	194 51.2	22.4
2	209 50.9	22.3
3	224 50.5	·· 22.2
4	239 50.2	22.1
5	254 49.9	22.0
6	269 49.6	−23 21.9
7	284 49.3	21.8
8	299 49.0	21.7
9	314 48.7	·· 21.6
10	329 48.4	21.5
11	344 48.1	21.5
12	359 47.8	−23 21.4
13	14 47.4	21.3
14	29 47.1	21.2
15	44 46.8	·· 21.1
16	59 46.5	21.0
17	74 46.2	20.9
18	89 45.9	−23 20.8
19	104 45.6	20.7
20	119 45.3	20.6
21	134 45.0	·· 20.5
22	149 44.7	20.4
23	164 44.3	20.3
0	179 44.0	−23 20.2
1	194 43.7	20.1
2	209 43.4	20.0
3	224 43.1	·· 19.8
4	239 42.8	19.7
5	254 42.5	19.6
6	269 42.2	−23 19.5
7	284 41.9	19.4
8	299 41.6	19.3
9	314 41.3	·· 19.2
10	329 40.9	19.1
11	344 40.6	19.0
12	359 40.3	−23 18.8
13	14 40.0	18.7
14	29 39.7	18.6
15	44 39.4	·· 18.5
16	59 39.1	18.4
17	74 38.8	18.3
18	89 38.5	−23 18.1
19	104 38.2	18.0
20	119 37.9	17.9
21	134 37.6	·· 17.8
22	149 37.2	17.7
23	164 36.9	17.5
0	179 36.6	−23 17.4
1	194 36.3	17.3
2	209 36.0	17.2
3	224 35.7	·· 17.0
4	239 35.4	16.9
5	254 35.1	16.8
6	269 34.8	−23 16.7
7	284 34.5	16.5
8	299 34.2	16.4
9	314 33.9	·· 16.3
10	329 33.6	16.1
11	344 33.3	16.0
12	359 32.9	−23 15.9
13	14 32.6	15.7
14	29 32.3	15.6
15	44 32.0	·· 15.5
16	59 31.7	15.3
17	74 31.4	15.2
18	89 31.1	−23 15.0
19	104 30.8	14.9
20	119 30.5	14.8
21	134 30.2	·· 14.6
22	149 29.9	14.5
23	164 29.6	14.3
24	179 29.3	−23 14.2
code	—	+1

No.	STARS SHA	Dec.	Transit Mer. Gr.
	° ′	° ′	h m
1	358 31.5	+28 49.7	17 40
2	358 21.1	+58 53.4	17 41
3	349 42.1	−18 15.0	18 16
4	339 20.0	+59 59.6	18 57
5	336 00.6	−57 29.0	19 10
6	332 25.7	+89 02.7	19 24
7	328 52.8	+23 14.4	19 39
8	315 53.0	−40 29.8	20 30
9	309 46.3	+49 41.8	20 55
10	291 42.1	+16 25.0	22 07
11	281 56.1	− 8 15.2	22 46
12	281 42.3	+45 57.3	22 47
13	279 21.2	+ 6 18.6	22 56
14	279 10.7	+28 34.3	22 57
15	276 32.9	− 1 13.7	23 07
16	271 51.0	+ 7 24.1	23 26
17	264 16.1	−52 40.0	0 00
18	259 14.1	−16 38.8	0 20
19	255 48.5	−28 54.2	0 34
20	245 47.7	+ 5 21.0	1 14
21	244 23.8	+28 08.7	1 20
22	234 36.6	−59 21.0	1 59
23	223 26.2	−43 14.1	2 43
24	221 49.3	−69 30.9	2 50
25	218 41.2	− 8 26.9	3 02
26	208 32.4	+12 12.1	3 43
27	194 47.7	+62 00.3	4 37
28	183 20.6	+14 50.3	5 23
29	174 01.4	−62 49.8	6 00
30	172 52.8	−56 50.5	6 05
31	168 46.6	−59 25.4	6 21
32	167 01.0	+56 12.8	6 28
33	159 30.0	+55 10.2	6 58
34	159 20.1	−10 54.7	6 59
35	153 35.2	+49 32.8	7 22
36	149 02.4	−36 08.0	7 40
37	146 38.0	+19 25.7	7 50
38	140 55.6	−60 38.3	8 12
39	137 18.1	+74 20.7	8 27
40	126 50.4	+26 52.3	9 09
41	120 37.8	−22 29.3	9 33
42	113 23.3	−26 19.7	10 02
43	109 07.3	−68 56.6	10 19
44	103 05.9	−15 40.1	10 43
45	97 25.1	−37 04.3	11 06
46	96 49.7	+12 35.5	11 08
47	91 08.1	+51 29.5	11 31
48	84 45.5	−34 24.7	11 56
49	81 10.7	+38 44.2	12 11
50	76 55.9	−26 21.6	12 28
51	62 53.6	+ 8 44.3	13 24
52	54 32.3	−56 53.7	13 57
53	50 03.5	+45 06.5	14 15
54	34 32.7	+ 9 39.2	15 17
55	28 41.8	−47 11.9	15 40
56	16 14.9	−29 52.8	16 30
57	14 24.5	+14 56.9	16 37

Lat.	Sunrise	Twlt. begins	Moonrise 27	28	29	30
N °	h m	h m	h m	h m	h m	h m
70	■	6 46	■	■	■	■
68	■	6 39	■	■	■	12 47
66	10 34	6 34	■	■	■	12 03
64	9 53	6 28	■	■	12 05	11 33
62	9 25	6 22	■	11 26	11 16	11 10
60	9 04	6 18	9 20	10 22	10 44	10 52
58	8 46	6 13	8 43	9 48	10 21	10 36
56	8 32	6 10	8 16	9 22	10 01	10 23
54	8 19	6 06	7 55	9 02	9 45	10 11
52	8 08	6 02	7 38	8 45	9 31	10 01
50	7 58	5 59	7 23	8 30	9 19	9 52
45	7 38	5 50	6 53	8 00	8 53	9 33
40	7 21	5 42	6 29	7 37	8 33	9 17
35	7 07	5 35	6 10	7 18	8 16	9 03
30	6 55	5 29	5 53	7 01	8 01	8 51
20	6 33	5 14	5 25	6 33	7 36	8 31
10	6 15	4 59	5 02	6 09	7 14	8 13
0	5 58	4 42	4 39	5 47	6 54	7 57
10	5 40	4 21	4 17	5 25	6 34	7 40
20	5 21	3 56	3 54	5 01	6 12	7 22
30	4 59	3 22	3 26	4 33	5 46	7 01
35	4 46	2 58	3 10	4 16	5 31	6 49
40	4 31	2 27	2 51	3 57	5 14	6 35
45	4 13	1 39	2 28	3 34	4 53	6 18
50	3 51	////	2 00	3 04	4 26	5 57
52	3 40	////	1 46	2 49	4 13	5 48
54	3 28	////	1 29	2 32	3 58	5 36
56	3 14	////	1 10	2 11	3 40	5 24
58	2 57	////	0 47	1 45	3 19	5 09
60	2 37	////	0 15	1 10	2 52	4 51
S						

Lat.	Sunset	Twlt. ends	Moonset 27	28	29	30
N °	h m	h m	h m	h m	h m	h m
70	■	17 15	■	■	■	■
68	■	17 22	■	■	■	15 55
66	13 29	17 30	■	■	■	16 38
64	14 10	17 35	■	■	14 26	17 06
62	14 38	17 40	■	12 44	15 15	17 28
60	14 59	17 45	12 28	13 49	15 45	17 46
58	15 16	17 49	13 06	14 23	16 08	18 00
56	15 31	17 53	13 32	14 48	16 27	18 12
54	15 44	17 57	13 53	15 08	16 43	18 23
52	15 55	18 01	14 11	15 25	16 56	18 33
50	16 04	18 03	14 26	15 40	17 08	18 41
45	16 25	18 12	14 56	16 09	17 32	18 59
40	16 41	18 19	15 20	16 32	17 52	19 14
35	16 56	18 27	15 39	16 51	18 08	19 26
30	17 08	18 33	15 56	17 07	18 22	19 36
20	17 29	18 48	16 24	17 34	18 45	19 54
10	17 48	19 03	16 49	17 57	19 06	20 10
0	18 05	19 20	17 11	18 19	19 24	20 24
10	18 22	19 40	17 34	18 41	19 43	20 39
20	18 41	20 05	17 58	19 04	20 03	20 54
30	19 03	20 39	18 26	19 30	20 25	21 11
35	19 16	21 03	18 43	19 46	20 39	21 21
40	19 31	21 34	19 02	20 04	20 54	21 33
45	19 49	22 21	19 25	20 26	21 12	21 46
50	20 11	////	19 55	20 53	21 34	22 02
52	20 22	////	20 10	21 07	21 45	22 10
54	20 34	////	20 27	21 22	21 56	22 18
56	20 49	////	20 48	21 40	22 10	22 27
58	21 05	////	21 14	22 02	22 25	22 38
60	21 25	////	21 49	22 30	22 44	22 50
S						

GCT	Equation of Time (App.—Mean) 27	28	29
h	m s	m s	m s
0	− 0 33.5	− 1 03.2	− 1 32.9
6	− 0 40.9	− 1 10.6	− 1 40.2
12	− 0 48.4	− 1 18.1	− 1 47.6
18	− 0 55.8	− 1 25.5	− 1 54.9
24	− 1 03.2	− 1 32.9	− 2 02.3

GCT of Transit Meridian of Greenwich

DAY	Moon	Venus	Mars	Jupiter	Saturn
	h m	h m	h m	h m	h m
27	10 55	9 02	6 50	18 01	6 36
28	12 03	9 03	6 48	17 57	6 33
29	13 09	9 04	6 46	17 54	6 29
30	14 11	9 05	6 44	17 50	6 25

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb	Venus	Mars
°	′	′	′
0			
	0.6	0.1	0.1
30			
	0.6	0.1	0.1
45			
	0.6	0.1	0.1
60			
	0.6	0.1	0.0
75			
	0.6	0.0	0.0
90			

Moon's Lower Limb
Add

Alt.	27	28	29
°	′	′	′
0			
	20.6	21.1	21.1
4			
	20.6	21.1	21.1
8			
	20.6	21.1	21.1
12			
	20.5	21.0	21.0
16			
	20.4	20.9	20.9
20			
	20.4	20.8	20.8
24			
	20.2	20.7	20.7
28			
	20.1	20.6	20.6
32			
	20.0	20.4	20.4
36			
	19.8	20.2	20.2
40			
	19.6	20.0	20.0
44			
	19.4	19.8	19.8
48			
	19.2	19.6	19.6
52			
	19.0	19.3	19.3
56			
	18.8	19.1	19.1
60			
	18.5	18.8	18.8
64			
	18.3	18.5	18.5
68			
	18.0	18.3	18.3
72			
	17.7	18.0	18.0
76			
	17.5	17.7	17.7
80			
	17.2	17.4	17.4
84			
	16.9	17.1	17.1
88			
	16.7	16.8	16.8
90			

Add to table, back cover

Moon's Upper Limb
Subtract

Alt.	27	28	29
°	′	′	′
0			
	12.6	12.4	12.4
4			
	12.7	12.4	12.4
8			
	12.7	12.4	12.4
12			
	12.8	12.5	12.5
16			
	12.8	12.6	12.6
20			
	12.9	12.7	12.7
24			
	13.0	12.8	12.8
28			
	13.2	12.9	12.9
32			
	13.3	13.2	13.2
36			
	13.5	13.3	13.3
40			
	13.7	13.5	13.5
44			
	13.9	13.7	13.7
48			
	14.1	13.9	13.9
52			
	14.3	14.2	14.2
56			
	14.5	14.4	14.4
60			
	14.8	14.7	14.7
64			
	15.0	15.0	15.0
68			
	15.3	15.2	15.2
72			
	15.5	15.5	15.5
76			
	15.8	15.8	15.8
80			
	16.1	16.1	16.1
84			
	16.4	16.4	16.4
88			
	16.6	16.7	16.7
90			

Subtract from table, back cover

New Moon 28

GCT	♈ GHA	VENUS −3.6 GHA	VENUS Dec.	MARS 1.3 GHA	MARS Dec.	JUPITER −2.0 GHA	JUPITER Dec.	SATURN 1.0 GHA	SATURN Dec.	MOON GHA	code	MOON Dec.	code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
0	97 37.7	223 51.8	−16 49.5	258 50.2	− 6 01.9	91 50.0	+ 1 04.5	263 27.4	− 3 28.3	155 52.4	39	−23 05.2	+108
1	112 40.2	238 51.3	50.3	273 51.4	02.4	106 52.3	04.6	278 29.7	28.3	170 15.3	41	22 54.4	+110
2	127 42.7	253 50.7	51.0	288 52.7	02.8	121 54.5	04.8	293 32.1	28.3	184 38.4	42	22 43.4	+111
3	142 45.1	268 50.2	·· 51.8	303 53.9	·· 03.3	136 56.8	·· 04.9	308 34.4	·· 28.4	199 01.6	44	·22 32.3	+112
4	157 47.6	283 49.7	52.5	318 55.2	03.8	151 59.0	05.0	323 36.8	28.4	213 25.0	44	22 21.1	+114
5	172 50.1	298 49.1	53.2	333 56.4	04.3	167 01.2	05.1	338 39.1	28.4	227 48.4	46	22 09.7	+115
6	187 52.5	313 48.6	−16 54.0	348 57.7	− 6 04.7	182 03.5	+ 1 05.2	353 41.5	− 3 28.5	242 12.0	48	−21 58.2	+117
7	202 55.0	328 48.1	54.7	3 58.9	05.2	197 05.7	05.3	8 43.8	28.5	256 35.8	48	21 46.5	+119
8	217 57.4	343 47.5	55.5	19 00.2	05.7	212 08.0	05.4	23 46.2	28.5	270 59.6	50	21 34.6	+119
9	232 59.9	358 47.0	·· 56.2	34 01.5	·· 06.2	227 10.2	·· 05.5	38 48.6	·· 28.6	285 23.6	51	·21 22.7	+121
10	248 02.4	13 46.5	56.9	49 02.7	06.6	242 12.5	05.6	53 50.9	28.6	299 47.7	53	21 10.6	+123
11	263 04.8	28 45.9	57.7	64 04.0	07.1	257 14.7	05.7	68 53.3	28.6	314 12.0	53	20 58.3	+124
12	278 07.3	43 45.4	−16 58.4	79 05.2	− 6 07.6	272 16.9	+ 1 05.8	83 55.6	− 3 28.7	328 36.3	56	−20 45.9	+125
13	293 09.8	58 44.9	59.1	94 06.5	08.1	287 19.2	05.9	98 58.0	28.7	343 00.9	56	20 33.4	+126
14	308 12.2	73 44.3	16 59.9	109 07.7	08.5	302 21.4	06.0	114 00.3	28.7	357 25.5	58	20 20.8	+128
15	323 14.7	88 43.8	·17 00.6	124 09.0	·· 09.0	317 23.7	·· 06.2	129 02.7	·· 28.8	11 50.3	59	·20 08.0	+129
16	338 17.2	103 43.3	01.3	139 10.2	09.5	332 25.9	06.3	144 05.1	28.8	26 15.2	60	19 55.1	+130
17	353 19.6	118 42.7	02.1	154 11.5	10.0	347 28.1	06.4	159 07.4	28.8	40 40.2	62	19 42.1	+131
18	8 22.1	133 42.2	−17 02.8	169 12.8	− 6 10.4	2 30.4	+ 1 06.5	174 09.8	− 3 28.8	55 05.4	63	−19 29.0	+132
19	23 24.6	148 41.6	03.5	184 14.0	10.9	17 32.6	06.6	189 12.1	28.9	69 30.7	65	19 15.8	+134
20	38 27.0	163 41.1	04.3	199 15.3	11.4	32 34.9	06.7	204 14.5	28.9	83 56.2	65	19 02.4	+134
21	53 29.5	178 40.6	·· 05.0	214 16.5	·· 11.9	47 37.1	·· 06.8	219 16.9	·· 28.9	98 21.7	67	·18 49.0	+136
22	68 31.9	193 40.0	05.7	229 17.8	12.3	62 39.3	06.9	234 19.2	29.0	112 47.4	69	18 35.4	+137
23	83 34.4	208 39.5	06.5	244 19.0	12.8	77 41.6	07.0	249 21.6	29.0	127 13.3	69	18 21.7	+138
0	98 36.9	223 38.9	−17 07.2	259 20.3	− 6 13.3	92 43.8	+ 1 07.1	264 23.9	− 3 29.0	141 39.2	71	−18 07.9	+139
1	113 39.3	238 38.4	07.9	274 21.6	13.8	107 46.1	07.3	279 26.3	29.1	156 05.3	73	17 54.0	+140
2	128 41.8	253 37.8	08.6	289 22.8	14.2	122 48.3	07.4	294 28.7	29.1	170 31.6	73	17 40.0	+140
3	143 44.3	268 37.3	·· 09.4	304 24.1	·· 14.7	137 50.5	·· 07.5	309 31.0	·· 29.1	184 57.9	75	·17 26.0	+142
4	158 46.7	283 36.8	10.1	319 25.3	15.2	152 52.8	07.6	324 33.4	29.2	199 24.4	76	17 11.8	+143
5	173 49.2	298 36.2	10.8	334 26.6	15.7	167 55.0	07.7	339 35.7	29.2	213 51.0	77	16 57.5	+144
6	188 51.7	313 35.7	−17 11.6	349 27.8	− 6 16.1	182 57.2	+ 1 07.8	354 38.1	− 3 29.2	228 17.7	79	−16 43.1	+144
7	203 54.1	328 35.1	12.3	4 29.1	16.6	197 59.5	07.9	9 40.5	29.3	242 44.6	80	16 28.7	+145
8	218 56.6	343 34.6	13.0	19 30.4	17.1	213 01.7	08.0	24 42.8	29.3	257 11.6	81	16 14.2	+147
9	233 59.0	358 34.0	·· 13.7	34 31.6	·· 17.5	228 03.9	·· 08.1	39 45.2	·· 29.3	271 38.7	82	·15 59.5	+147
10	249 01.5	13 33.5	14.4	49 32.9	18.0	243 06.2	08.2	54 47.5	29.3	286 05.9	84	15 44.8	+147
11	264 04.0	28 32.9	15.2	64 34.1	18.5	258 08.4	08.4	69 49.9	29.4	300 33.3	84	15 30.1	+149
12	279 06.4	43 32.4	−17 15.9	79 35.4	− 6 19.0	273 10.6	+ 1 08.5	84 52.3	− 3 29.4	315 00.7	86	−15 15.2	+149
13	294 08.9	58 31.8	16.6	94 36.7	19.4	288 12.9	08.6	99 54.6	29.4	329 28.3	88	15 00.3	+150
14	309 11.4	73 31.3	17.3	109 37.9	19.9	303 15.1	08.7	114 57.0	29.5	343 56.1	88	14 45.3	+151
15	324 13.8	88 30.7	·· 18.0	124 39.2	·· 20.4	318 17.3	·· 08.8	129 59.3	·· 29.5	358 23.9	89	·14 30.2	+151
16	339 16.3	103 30.2	18.8	139 40.4	20.8	333 19.6	08.9	145 01.7	29.5	12 51.8	91	14 15.1	+152
17	354 18.8	118 29.6	19.5	154 41.7	21.3	348 21.8	09.0	160 04.1	29.6	27 19.9	92	13 59.9	+153
18	9 21.2	133 29.1	−17 20.2	169 43.0	− 6 21.8	3 24.0	+ 1 09.1	175 06.4	− 3 29.6	41 48.1	93	−13 44.6	+153
19	24 23.7	148 28.5	20.9	184 44.2	22.3	18 26.3	09.3	190 08.8	29.6	56 16.4	94	13 29.3	+154
20	39 26.2	163 28.0	21.6	199 45.5	22.7	33 28.5	09.4	205 11.2	29.7	70 44.8	95	13 13.9	+154
21	54 28.6	178 27.4	·· 22.3	214 46.7	·· 23.2	48 30.7	·· 09.5	220 13.5	·· 29.7	85 13.3	96	·12 58.5	+155
22	69 31.1	193 26.9	23.1	229 48.0	23.7	63 33.0	09.6	235 15.9	29.7	99 41.9	98	12 43.0	+156
23	84 33.5	208 26.3	23.8	244 49.3	24.1	78 35.2	09.7	250 18.2	29.7	114 10.7	98	12 27.4	+156
0	99 36.0	223 25.8	−17 24.5	259 50.5	− 6 24.6	93 37.4	+ 1 09.8	265 20.6	− 3 29.8	128 39.5	100	−12 11.8	+157
1	114 38.5	238 25.2	25.2	274 51.8	25.1	108 39.7	09.9	280 23.0	29.8	143 08.5	100	11 56.1	+157
2	129 40.9	253 24.7	25.9	289 53.1	25.6	123 41.9	10.0	295 25.3	29.8	157 37.5	102	11 40.4	+157
3	144 43.4	268 24.1	·· 26.6	304 54.3	·· 26.0	138 44.1	·· 10.2	310 27.7	·· 29.9	172 06.7	102	·11 24.7	+158
4	159 45.9	283 23.5	27.3	319 55.6	26.5	153 46.4	10.3	325 30.1	29.9	186 35.9	104	11 08.9	+158
5	174 48.3	298 23.0	28.0	334 56.9	27.0	168 48.6	10.4	340 32.4	29.9	201 05.3	105	10 53.1	+159
6	189 50.8	313 22.4	−17 28.8	349 58.1	− 6 27.4	183 50.8	+ 1 10.5	355 34.8	− 3 29.9	215 34.8	105	−10 37.2	+159
7	204 53.3	328 21.9	29.5	4 59.4	27.9	198 53.0	10.6	10 37.2	30.0	230 04.3	107	10 21.3	+159
8	219 55.7	343 21.3	30.2	20 00.7	28.4	213 55.3	10.7	25 39.5	30.0	244 34.0	107	10 05.4	+160
9	234 58.2	358 20.8	·· 30.9	35 01.9	·· 28.8	228 57.5	·· 10.8	40 41.9	·· 30.0	259 03.7	109	· 9 49.4	+160
10	250 00.7	13 20.2	31.6	50 03.2	29.3	243 59.7	11.0	55 44.3	30.1	273 33.6	109	9 33.4	+161
11	265 03.1	28 19.6	32.3	65 04.4	29.8	259 02.0	11.1	70 46.6	30.1	288 03.5	111	9 17.3	+160
12	280 05.6	43 19.1	−17 33.0	80 05.7	− 6 30.2	274 04.2	+ 1 11.2	85 49.0	− 3 30.1	302 33.6	111	− 9 01.3	+161
13	295 08.0	58 18.5	33.7	95 07.0	30.7	289 06.4	11.3	100 51.4	30.2	317 03.7	112	8 45.2	+161
14	310 10.5	73 17.9	34.4	110 08.2	31.2	304 08.6	11.4	115 53.7	30.2	331 33.9	113	8 29.1	+162
15	325 13.0	88 17.4	·· 35.1	125 09.5	·· 31.7	319 10.9	·· 11.5	130 56.1	·· 30.2	346 04.2	114	· 8 12.9	+162
16	340 15.4	103 16.8	35.8	140 10.8	32.1	334 13.1	11.6	145 58.5	30.2	0 34.6	114	7 56.7	+161
17	355 17.9	118 16.3	36.5	155 12.0	32.6	349 15.3	11.8	161 00.8	30.3	15 05.0	116	7 40.6	+162
18	10 20.4	133 15.7	−17 37.2	170 13.3	− 6 33.1	4 17.6	+ 1 11.9	176 03.2	− 3 30.3	29 35.6	116	− 7 24.4	+163
19	25 22.8	148 15.1	37.9	185 14.6	33.5	19 19.8	12.0	191 05.6	30.3	44 06.2	117	7 08.1	+162
20	40 25.3	163 14.6	38.6	200 15.8	34.0	34 22.0	12.1	206 07.9	30.4	58 36.9	118	6 51.9	+162
21	55 27.8	178 14.0	·· 39.3	215 17.1	·· 34.5	49 24.2	·· 12.2	221 10.3	·· 30.4	73 07.7	119	· 6 35.7	+163
22	70 30.2	193 13.5	40.0	230 18.4	34.9	64 26.5	12.3	236 12.7	30.4	87 38.6	119	6 19.4	+163
23	85 32.7	208 12.9	40.7	245 19.6	35.4	79 28.7	12.4	251 15.0	30.4	102 09.5	120	6 03.1	+163
24	100 35.2	223 12.4	−17 41.4	260 20.9	− 6 35.9	94 30.9	+ 1 12.6	266 17.4	− 3 30.5	116 40.5	121	− 5 46.8	+162
code	—	− 6	− 7	+ 13	− 4	+ 23	+ 1	+ 23	0				

GCT h	SUN GHA ° ′	Dec. ° ′
0	179 29.3	−23 14.2
1	194 29.0	14.1
2	209 28.7	13.9
3	224 28.4 ··	13.8
4	239 28.1	13.6
5	254 27.8	13.5
6	269 27.4	−23 13.3
7	284 27.1	13.2
8	299 26.8	13.0
9	314 26.5 ··	12.9
10	329 26.2	12.7
11	344 25.9	12.6
12	359 25.6	−23 12.4
13	14 25.3	12.3
14	29 25.0	12.1
15	44 24.7 ··	12.0
16	59 24.4	11.8
17	74 24.1	11.6
18	89 23.8	−23 11.5
19	104 23.5	11.3
20	119 23.2	11.2
21	134 22.9 ··	11.0
22	149 22.6	10.8
23	164 22.3	10.7
0	179 22.0	−23 10.5
1	194 21.7	10.4
2	209 21.4	10.2
3	224 21.1 ··	10.0
4	239 20.8	09.9
5	254 20.5	09.7
6	269 20.2	−23 09.5
7	284 19.9	09.4
8	299 19.6	09.2
9	314 19.3 ··	09.0
10	329 19.0	08.8
11	344 18.7	08.7
12	359 18.4	−23 08.5
13	14 18.1	08.3
14	29 17.8	08.2
15	44 17.4 ··	08.0
16	59 17.1	07.8
17	74 16.8	07.6
18	89 16.5	−23 07.5
19	104 16.2	07.3
20	119 15.9	07.1
21	134 15.6 ··	06.9
22	149 15.3	06.7
23	164 15.0	06.6
0	179 14.7	−23 06.4
1	194 14.4	06.2
2	209 14.1	06.0
3	224 13.8 ··	05.8
4	239 13.5	05.6
5	254 13.2	05.5
6	269 12.9	−23 05.3
7	284 12.6	05.1
8	299 12.3	04.9
9	314 12.0 ··	04.7
10	329 11.7	04.5
11	344 11.4	04.3
12	359 11.2	−23 04.1
13	14 10.9	03.9
14	29 10.6	03.7
15	44 10.3 ··	03.5
16	59 10.0	03.4
17	74 09.7	03.2
18	89 09.4	−23 03.0
19	104 09.1	02.8
20	119 08.8	02.6
21	134 08.5 ··	02.4
22	149 08.2	02.2
23	164 07.9	02.0
24	179 07.6	−23 01.8
code	−	+ 2

STARS No.	SHA ° ′	Dec. ° ′	Transit Mer. Gr. h m
1	358 31.5	+28 49.7	17 29
2	358 21.1	+58 53.4	17 29
3	349 42.1	−18 15.0	18 04
4	339 20.1	+59 59.6	18 45
5	336 00.6	−57 29.0	18 58
6	332 26.5	+89 02.7	19 13
7	328 52.8	+23 14.4	19 27
8	315 53.0	−40 29.8	20 19
9	309 46.3	+49 41.8	20 43
10	291 42.1	+16 25.0	21 55
11	281 56.1	− 8 15.2	22 34
12	281 42.3	+45 57.3	22 35
13	279 21.2	+ 6 18.6	22 44
14	279 10.7	+28 34.3	22 45
15	276 32.9	− 1 13.7	22 56
16	271 51.0	+ 7 24.1	23 14
17	264 16.1	−52 40.0	23 45
18	259 14.1	−16 38.8	0 09
19	255 48.5	−28 54.2	0 22
20	245 47.7	+ 5 21.0	1 02
21	244 23.7	+28 08.7	1 08
22	234 36.5	−59 21.1	1 47
23	223 26.2	−43 14.1	2 31
24	221 49.2	−69 30.9	2 38
25	218 41.2	− 8 26.9	2 50
26	208 32.4	+12 12.1	3 31
27	194 47.6	+62 00.3	4 26
28	183 20.6	+14 50.3	5 11
29	174 01.3	−62 49.8	5 49
30	172 52.7	−56 50.5	5 53
31	168 46.6	−59 25.4	6 09
32	167 00.9	+56 12.8	6 16
33	159 29.9	+55 10.2	6 46
34	159 20.1	−10 54.7	6 47
35	153 35.2	+49 32.8	7 10
36	149 02.4	−36 08.0	7 28
37	146 38.0	+19 25.7	7 38
38	140 55.5	−60 38.3	8 01
39	137 18.1	+74 20.7	8 15
40	126 50.3	+26 52.3	8 57
41	120 37.8	−22 29.3	9 21
42	113 23.3	−26 19.7	9 50
43	109 07.3	−68 56.6	10 07
44	103 05.9	−15 40.2	10 31
45	97 25.1	−37 04.3	10 54
46	96 49.7	+12 35.4	10 56
47	91 08.1	+51 29.5	11 19
48	84 45.5	−34 24.7	11 45
49	81 10.7	+38 44.1	11 59
50	76 55.9	−26 21.6	12 16
51	62 53.6	+ 8 44.3	13 12
52	54 32.3	−56 53.7	13 45
53	50 03.5	+45 06.5	14 03
54	34 32.7	+ 9 39.2	15 05
55	28 41.8	−47 11.9	15 28
56	16 14.9	−29 52.8	16 18
57	14 24.5	+14 56.9	16 25

Lat. °	Sunrise h m	Twlt. begins h m	Moonrise 30 h m	Moonrise 31 h m	Moonrise 1 h m	h m
N 70	▬	6 47	▬	12 17	11 36	
68	▬	6 39	12 47	11 53	11 25	
66	10 31	6 33	12 03	11 34	11 15	
64	9 51	6 28	11 33	11 18	11 08	
62	9 24	6 23	11 10	11 05	11 01	
60	9 03	6 18	10 52	10 54	10 55	
58	8 46	6 14	10 36	10 45	10 50	
56	8 32	6 10	10 23	10 36	10 45	
54	8 19	6 06	10 11	10 29	10 41	
52	8 08	6 02	10 01	10 22	10 37	
50	7 59	6 00	9 52	10 16	10 34	
45	7 38	5 51	9 33	10 02	10 26	
40	7 22	5 43	9 17	9 51	10 19	
35	7 08	5 36	9 03	9 42	10 14	
30	6 55	5 30	8 51	9 33	10 09	
20	6 35	5 15	8 31	9 19	10 01	
10	6 16	5 01	8 13	9 06	9 53	
0	5 59	4 44	7 57	8 54	9 46	
10	5 42	4 23	7 40	8 42	9 39	
20	5 23	3 58	7 22	8 29	9 31	
30	5 01	3 25	7 01	8 14	9 23	
35	4 48	3 01	6 49	8 05	9 18	
40	4 33	2 31	6 35	7 55	9 12	
45	4 16	1 44	6 18	7 44	9 05	
50	3 53	////	5 57	7 29	8 57	
52	3 43	////	5 48	7 23	8 53	
54	3 30	////	5 36	7 15	8 49	
56	3 17	////	5 24	7 07	8 45	
58	3 00	////	5 09	6 57	8 39	
60	2 40	////	4 51	6 47	8 34	
S						

Lat. °	Sunset h m	Twlt. ends h m	Moonset 30 h m	Moonset 31 h m	Moonset 1 h m	h m
N 70	▬	17 18	▬	18 24	20 51	
68	▬	17 25	15 55	18 46	20 59	
66	13 35	17 32	16 38	19 03	21 06	
64	14 15	17 38	17 06	19 17	21 12	
62	14 42	17 43	17 28	19 28	21 17	
60	15 03	17 48	17 46	19 38	21 21	
58	15 20	17 52	18 00	19 46	21 25	
56	15 34	17 56	18 12	19 54	21 29	
54	15 46	17 59	18 23	20 00	21 32	
52	15 57	18 02	18 33	20 06	21 34	
50	16 07	18 06	18 41	20 12	21 37	
45	16 27	18 13	18 59	20 23	21 42	
40	16 44	18 21	19 14	20 32	21 47	
35	16 58	18 29	19 26	20 40	21 50	
30	17 10	18 35	19 36	20 47	21 54	
20	17 31	18 50	19 54	20 59	22 00	
10	17 49	19 04	20 10	21 10	22 04	
0	18 07	19 22	20 24	21 19	22 09	
10	18 24	19 42	20 39	21 29	22 14	
20	18 42	20 06	20 54	21 39	22 19	
30	19 04	20 40	21 11	21 50	22 24	
35	19 17	21 03	21 21	21 57	22 27	
40	19 32	21 34	21 33	22 04	22 31	
45	19 50	22 21	21 46	22 13	22 34	
50	20 12	////	22 02	22 23	22 39	
52	20 22	////	22 10	22 28	22 41	
54	20 34	////	22 18	22 33	22 44	
56	20 48	////	22 27	22 38	22 46	
58	21 05	////	22 38	22 45	22 49	
60	21 24	////	22 50	22 52	22 52	
S						

GCT h	Equation of Time (App.—Mean) 30 m s	31 m s	1 m s
0	− 2 02.3	− 2 31.5	− 3 00.4
6	− 2 09.6	− 2 38.7	− 3 07.6
12	− 2 16.9	− 2 46.0	− 3 14.8
18	− 2 24.2	− 2 53.2	− 3 22.0
24	− 2 31.5	− 3 00.4	− 3 29.1

GCT of Transit Meridian of Greenwich

DAY	Moon h m	Venus h m	Mars h m	Jupiter h m	Saturn h m
30	14 11	9 05	6 44	17 50	6 25
31	15 07	9 06	6 42	17 46	6 21
1	15 58	9 07	6 40	17 43	6 18

ADDITIONAL ALTITUDE CORRECTIONS

Alt. °	Sun's Low'r Limb ′	Venus ′	Mars ′
0–30	0.6	0.1	0.1
30–45	0.6	0.1	0.1
45–60	0.6	0.1	0.1
60–75	0.6	0.1	0.0
75–90	0.6	0.0	0.0

Moon's Lower Limb
Add

Alt. °	30 ′	31 ′	1 ′
0–4	20.6	19.9	18.9
4–8	20.6	19.9	18.8
8–12	20.6	19.8	18.8
12–16	20.5	19.8	18.8
16–20	20.4	19.7	18.7
20–24	20.4	19.6	18.7
24–28	20.2	19.5	18.6
28–32	20.1	19.4	18.5
32–36	20.0	19.3	18.4
36–40	19.8	19.2	18.3
40–44	19.6	19.0	18.2
44–48	19.4	18.8	18.1
48–52	19.2	18.7	17.9
52–56	19.0	18.5	17.8
56–60	18.8	18.3	17.6
60–64	18.5	18.1	17.5
64–68	18.3	17.9	17.3
68–72	18.0	17.6	17.1
72–76	17.7	17.4	17.0
76–80	17.5	17.2	16.8
80–84	17.2	17.0	16.6
84–88	16.9	16.7	16.4
88–90	16.7	16.5	16.3

Add to table, back cover

Moon's Upper Limb
Subtract

Alt. °	30 ′	31 ′	1 ′
0–4	12.6	13.1	13.7
4–8	12.7	13.1	13.7
8–12	12.7	13.1	13.7
12–16	12.8	13.2	13.7
16–20	12.8	13.2	13.8
20–24	12.9	13.3	13.8
24–28	13.0	13.4	13.9
28–32	13.2	13.5	14.0
32–36	13.3	13.7	14.1
36–40	13.5	13.8	14.2
40–44	13.7	13.9	14.3
44–48	13.9	14.1	14.5
48–52	14.1	14.3	14.6
52–56	14.3	14.5	14.7
56–60	14.5	14.7	14.9
60–64	14.8	14.9	15.0
64–68	15.0	15.1	15.2
68–72	15.3	15.3	15.4
72–76	15.5	15.5	15.5
76–80	15.8	15.8	15.7
80–84	16.1	16.0	15.9
84–88	16.4	16.2	16.1
88–90	16.6	16.4	16.2

Subtract from table, back cover

New Year's Day 1

EXPLANATION AND EXAMPLES

1. Object. The object of this volume is to provide in convenient form the astronomical data required by mariners. In the front part of the book two facing pages give complete data for every hour of three days. The yellow pages give 60 tables, one for every minute of the hour. Each table has two parts. One part (consisting of the first four columns) has 61 lines, one for every second of the minute, used to bring the hourly value of the Greenwich hour angle (GHA) up to the minute and second of observation. The other part (making up the last three columns), with 181 values, is for use in bringing the hourly value of the declination up to the minute of observation (the second is not needed for the Dec.), and also for obtaining small corrections to the GHA of the planets and Moon. Altitude correction tables are on the covers, and small additional altitude corrections for the Sun, Moon, Venus, and Mars are on the daily pages.

2. Sun, Moon, and planets. The daily pages give the GHA and Dec. of the Sun, Moon, and four planets at 1-hour intervals, and also a code at the foot of the column (at the right for the Moon) to be used with the yellow table, except for the GHA of the Sun and vernal equinox (♈), where no code is needed. The sign of the code correction is the sign attached to the code on the daily pages; for the Moon's GHA the sign (not printed) is always plus. The magnitudes of the planets are given in the headings.

Example: For 1951 January 2, $17^h\ 44^m\ 16^s$, Greenwich civil time, find the GHA and Dec. of the Sun.

	GHA	Dec.	code
	° ′	° ′	
(From daily page for Jan. 1, 2, 3) Jan. 2, 17^h	74 01.3	−22 57.0	+2
(From yellow table 44^m, Sun, 16^s) $44^m\ 16^s$	11 04.0		
(From yellow table 44^m, code 2) code correction		+0.1	
The required GHA and Dec.	85 05.3	−22 56.9	

Example: For 1951 January 3, $6^h\ 45^m\ 51^s$ GCT, find the GHA and Dec. of Venus.

	GHA	code	Dec.	code
(From daily page for Jan. 1, 2, 3)	° ′		° ′	
Jan. 3, 6^h	255 44.5	−9	−22 28.7	+5
(From yellow table 45^m, planets, 51^s) $45^m\ 51^s$	11 27.8			
(From yellow table 45^m, codes 9 and 5) code correction	−0.7		+0.4	
The required GHA and Dec.	267 11.6		−22 28.3	

Example: For 1951 January 3, $22^h\ 44^m\ 27^s$ GCT, find the GHA and Dec. of the Moon.

	GHA	code	Dec.	code
(From daily page for Jan. 1, 2, 3)	° ′		° ′	
Jan. 3, 22^h	208 28.3	+66	−21 12.8	−120
(From yellow table 44^m, Moon, 27^s) $44^m\ 27^s$	10 36.4			
(From yellow table 44^m, codes 66 and 120) code correction	+4.9		−8.9	
The required GHA and Dec.	219 9.6		−21 21.7	

3. Stars. The GHA of a star is found by adding the GHA of the vernal equinox to the star's sidereal hour angle:

$$\text{GHA}* \ = \ \text{GHA}\Upsilon \ + \ \text{SHA}*.$$

On the right-hand daily pages are given the SHA, Dec., and time of transit over the meridian of Greenwich for 57 stars. The data are for the middle of the second day. The SHA and Dec. may be used without appreciable error for three days. The time of transit is four minutes later on the first day and four minutes earlier on the third day. The names and magnitudes of the stars are given inside the front cover, and also on the outside of the back cover.

Example: For 1951 January 2, $17^h\ 44^m\ 19^s$ GCT, find the GHA and Dec. of star 12.

	GHA	Dec.
	° ′	° ′
(From daily page for Jan. 1, 2, 3) SHA and Dec.	281 43.5	+45 57.2
(From daily page for Jan. 1, 2, 3) GHA ♈, Jan. 2, 17^h	356 31.3	
(From yellow table 44^m, ♈, 19^s) $44^m\ 19^s$	11 06.6	
The required GHA, rejecting 360°	289 21.4	

4. Altitude Corrections. Three altitude corrections are given, except for the stars, Jupiter, and Saturn, where only two are needed. The correction for *height of eye,* used for all objects, is inside the front cover. For the *Sun's lower limb,* use also the correction from the Sun table inside the front cover and add the small additional correction from the daily page. For *stars* and *planets* use (in addition to the dip correction) the correction from the star and planet table inside the front cover, and for *Venus* and *Mars* add the small additional correction from the daily page. For the *Moon,* use (in addition to the dip correction) the correction from the Moon table inside the back cover and apply the additional limb correction from the daily page; the limb corrections are given for 12^h GCT of each day, and may be taken directly out of the table without interpolation.

Example: Correct the following observed altitudes, taken at height 35 feet on 1951 January 3.

	Sun (lower limb)	Moon (upper limb)	Moon (lower limb)	Venus	Polaris
	° ′	° ′	° ′	° ′	° ′
Observed altitude	40 25.5	25 11.7	29 40.1	41 13.6	15 49.3
Height of eye	− 5.6	− 5.6	− 5.6	− 5.6	− 5.6
Cover tables	+14.7	+49.5	+47.8	− 1.1	− 3.4
(From daily page) additional correction	+ 0.6	−13.8	+18.7	+ 0.1	
Corrected altitude	40 35.2	25 41.8	30 41.0	41 07.0	15 40.3

Caution. In H. O. 218 and H. O. 249, refraction at a height of eye of 5000 feet is already included, and the altitude corrections in this book are not to be used.

Bubble sextant observations and *Sun's upper limb.* If the upper limb of the Sun is observed, correct the altitude as if the lower limb had been observed, and apply the additional correction from the table below. If the center of the Sun or Moon is observed, calculate the correction for the two limbs separately, and take the average of the two results.

ADDITIONAL CORRECTION FOR SUN'S UPPER LIMB

(to be applied to the correction for the lower limb)

Dates	Correction	Dates
	′	
Jan. 1 to Jan. 26	−32.6	Dec. 12 to Dec. 31
Jan. 27 to Feb. 14	−32.5	Nov. 23 to Dec. 11
Feb. 15 to Feb. 28	−32.4	Nov. 9 to Nov. 22
Mar. 1 to Mar. 12	−32.3	Oct. 28 to Nov. 8
Mar. 13 to Mar. 24	−32.2	Oct. 17 to Oct. 27
Mar. 25 to Apr. 3	−32.1	Oct. 6 to Oct. 16
Apr. 4 to Apr. 14	−32.0	Sept. 25 to Oct. 5
Apr. 15 to Apr. 26	−31.9	Sept. 13 to Sept. 24
Apr. 27 to May 8	−31.8	Sept. 1 to Sept. 12
May 9 to May 23	−31.7	Aug. 17 to Aug. 31
May 24 to June 15	−31.6	July 25 to Aug. 16
June 16 to July 24	−31.5	

5. Latitude from Polaris. The tables on the last white page and the first yellow page give three corrections which must be applied to a corrected altitude of Polaris to get the latitude. All three tables depend on the local hour angle of the vernal equinox. The second table depends also on the date and the third on the corrected altitude.

Example: On 1951 January 3, $13^h 45^m 35^s$ GCT in longitude 74° west the observed altitude of Polaris was 15° 49.′3. Find the latitude.

	° ′
(From the daily page for Jan. 1, 2, 3) GHA ♈, Jan. 3,13^h	297 20.6
(From yellow table 45,^{m} ♈, 35^s) 45^m 35^s	11 25.6
GHA ♈	308 46.2
Longitude west (subtract)	74 00.0
LHA ♈	234 46.2

	° ′
Corrected altitude (from example of section 4)	15 40.3
Correction for LHA ♈, 234°.8	+51.3
Correction for LHA ♈ and date	− 0.1
Correction for LHA ♈ and corrected altitude	− 0.1
Latitude	16 31.4

The page preceding the other Polaris tables gives the azimuth, depending on LHA ♈ and the latitude.

6. Sunrise, sunset, twilight, moonrise, moonset. Data for finding these for latitudes between 60° south and 70° north are given on the right-hand daily pages. Sunrise, sunset, and the beginning and ending of astronomical twilight are given for the middle day; they are sufficiently accurate for three days. Moonrise and moonset are given for four days for the Greenwich meridian in order to facilitate estimation of times for other longitudes. All times in these columns are local civil times. The precise time of moonrise or moonset is seldom needed; a glance at the table will usually show whether the Moon is up, and favorably placed for observation. If needed, however, the precise time may be obtained as follows. Interpolate for latitude on the day wanted, and also on the preceding day in east longitudes, or the following day in west longitudes. Take the difference between the two results, multiply it by the longitude divided by 360°, and apply the product to the datum for the day wanted, so as to bring the result between the two results previously found.

Example: Find the time of moonrise on 1951 January 3, in longitude 60° west, latitude 42° north.

	h m
January 3, Greenwich, latitude 42° north	2 28
January 4, Greenwich, latitude 42° north	3 48
Difference	80
Correction for longitude, $\frac{60}{360}\times 80$	13
Local civil time of moonrise	2 41
GCT of moonrise (60°=4^h)	6 41

The times of moonrise and moonset are sometimes greater than 24^h. This means that the phenomenon really occurs on the following day but the time is given in this form to facilitate the interpolation for longitude. For any given meridian the time of moonrise or moonset is about an hour later (on the average) each succeeding day. If then, on a given day, one of these phenomena occurs shortly before midnight, the next one will occur about 25 hours later which carries it over into the second day.

Some of the phenomena do not occur in high latitudes during certain periods. The symbols used to indicate the exceptions are:

□, Sun or Moon does not set but remains continuously above the horizon.

■, Sun or Moon does not rise but remains continuously below the horizon.

////, Twilight lasts all night.

7. Equation of time. This is given on the right-hand daily pages, at intervals of 6 hours. It is to be applied to mean time in order to obtain apparent time.

8. Meridian transit of Moon and planets. The GCT of transit of the Moon and planets over the meridian of Greenwich is given for every day on the right-hand daily pages. The LCT of transit over another meridian may be obtained as described for moonrise in section 6.

9. Accuracy. Although the quantities in this volume are given to tenths of minutes, in general the GHA and Dec. of an object cannot actually be obtained accurate to 0′.1. The chief reason for loss of accuracy is the error of rounding off; any quantity given to 0′.1 is necessarily subject to an error that may be as large as 0′.05. When several such quantities are added together the errors of rounding may accumulate.

In general, the largest error that can occur in a GHA or Dec. taken from this volume is about 0′.2. In practice it may be expected that two-thirds of the quantities taken out will have errors less than 0′.1, and one-third will have errors between 0′.1 and 0′.2.

In the case of the Sun's GHA the error will on occasions be 0′.1 greater than the figures just given, owing to neglecting the code. This last error has been minimized by adjusting the printed GHA in such a way as to spread the error through the hour.

10. Using the 1951 Almanac in 1952. This volume may be used in 1952 for the Sun and stars, with errors generally less than 0′.4, in the following way.

Calculate the GHA of a star for the same date and time and subtract 15′.1 in January and February, add 44′.0 in March through December. Take out the Dec. of a star for the same date.

For the Sun's GHA use the same date and time and apply the correction from table on page 253.

Take out the Sun's Dec. for a time $5^h\ 48^m\ 46^s$ earlier than the time of the observation.

11. Right ascension. The right ascensions of objects are not needed in navigation. They may, however, be obtained if desired from the data in this volume.

The right ascension of a star is obtained by subtracting the SHA from 360°, and converting from arc to time by the table on page 254.

Example: Find the right ascension of star 12 on 1951 January 3.

			° ′
			360 00.0
(From daily page for Jan. 1, 2, 3) SHA			281 43.5
Difference		s	78 16.5
	78°	$5^h\ 12^m$ 00.0	
	16′	1 04.0	
	0′.5 or 30″	02.0	
	right ascension	$5^h\ 13^m\ 06^s.0$	

The right ascension of the Sun, Moon, or a planet may be obtained by subtracting the GHA of the object from GHA ♈, and converting from arc to time.

Example: Find the right ascension of the Moon on 1951 January 2, $3^h\ 44^m\ 51^s$ GCT.

	♈	Moon	Code
(From the daily page for Jan. 1, 2, 3)	° ′	° ′	
Jan. 2, 3^h	145 56.8	306 10.3	+117
(From the yellow table 44^m, 51^s) $44^m\ 51^s$	11 14.6	10 42.1	
(From yellow table 44^m, code 117) code correction		+8.7	
GHA	157 11.4	317 1.1	
	° ′		
Difference	200 10.3		

200°	$13^h\ 20^m\ 00^s.0$
10′	40 .0
0′.3 or 18″	01 .2
Right ascension	$13^h\ 20^m\ 41^s.2$

SUN'S GHA IN 1952

Apply to 1951 value to obtain 1952 value for same date and GCT.

		′			′			′			′			′			′
Jan.	18	+1.3	Apr.	14	+3.1	May	29	−1.5	Aug.	4	+1.1	Oct.	15	+2.9	Nov.	15	−1.7
	21	+1.1		17	+2.9		31	−1.7		6	+1.3		16	+2.7		16	−1.9
	23	+0.9		19	+2.7	June	6	−1.9		7	+1.5		17	+2.5		17	−2.1
	26	+0.7		21	+2.5		16	−2.1		8	+1.7		19	+2.3		18	−2.3
	28	+0.5		22	+2.3		20	−2.3		10	+1.9		20	+2.1		19	−2.5
	31	+0.3		24	+2.1		30	−2.5		12	+2.1		22	+1.9		20	−2.7
Feb.	10	+0.1		26	+1.9	July	2	−2.3		14	+2.3		23	+1.7		21	−2.9
	17	−0.1		28	+1.7		4	−2.1		17	+2.5		24	+1.5		23	−3.1
	20	−0.3		30	+1.5		6	−1.9		20	+2.7		26	+1.3		24	−3.3
	23	−0.5	May	1	+1.3		8	−1.7		24	+2.9		27	+1.1		26	−3.5
	26	−0.7		4	+1.1		9	−1.5		27	+3.1		29	+0.9		27	−3.7
	28	−0.9		7	+0.9		12	−1.3		29	+3.3		31	+0.7		30	−3.9
	..	..		10	+0.7		14	−1.1		31	+3.5	Nov.	2	+0.5	Dec.	2	−4.1
Mar.	1	+1.9		12	+0.5		17	−0.9	Sept.	2	+3.7		4	+0.3		5	−4.3
	4	+2.1		14	+0.3		20	−0.7		5	+3.9		5	+0.1		7	−4.5
	6	+2.3		16	+0.1		23	−0.5		7	+4.1		6	−0.1		9	−4.7
	8	+2.5		18	−0.1		25	−0.3		17	+4.3		8	−0.3		11	−4.9
	9	+2.7		19	−0.3		27	−0.1		22	+4.1		9	−0.5		13	−5.1
	11	+2.9		21	−0.5		29	+0.1	Oct.	1	+3.9		10	−0.7		15	−5.3
	14	+3.1		22	−0.7		30	+0.3		7	+3.7		11	−0.9		17	−5.5
	18	+3.3		23	−0.9		31	+0.5		10	+3.5		12	−1.1		20	−5.7
	24	+3.5		25	−1.1	Aug.	2	+0.7		12	+3.3		13	−1.3		25	−5.9
	30	+3.3		27	−1.3		3	+0.9		13	+3.1		14	−1.5		28	−5.7
Apr.	14	+3.1		29	−1.5		4	+1.1		15	+2.9		15	−1.7		30	−5.5
																	−5.3

For a date given in the table, use the upper of the two possible values.

°	h m	°	h m	°	h m	°	h m	°	h m	°	h m	′	m s	″	s
0	0 0	60	4 0	120	8 0	180	12 0	240	16 0	300	20 0	0	0 0	0	0.00
1	0 4	61	4 4	121	8 4	181	12 4	241	16 4	301	20 4	1	0 4	1	0.07
2	0 8	62	4 8	122	8 8	182	12 8	242	16 8	302	20 8	2	0 8	2	0.13
3	0 12	63	4 12	123	8 12	183	12 12	243	16 12	303	20 12	3	0 12	3	0.20
4	0 16	64	4 16	124	8 16	184	12 16	244	16 16	304	20 16	4	0 16	4	0.27
5	0 20	65	4 20	125	8 20	185	12 20	245	16 20	305	20 20	5	0 20	5	0.33
6	0 24	66	4 24	126	8 24	186	12 24	246	16 24	306	20 24	6	0 24	6	0.40
7	0 28	67	4 28	127	8 28	187	12 28	247	16 28	307	20 28	7	0 28	7	0.47
8	0 32	68	4 32	128	8 32	188	12 32	248	16 32	308	20 32	8	0 32	8	0.53
9	0 36	69	4 36	129	8 36	189	12 36	249	16 36	309	20 36	9	0 36	9	0.60
10	0 40	70	4 40	130	8 40	190	12 40	250	16 40	310	20 40	10	0 40	10	0.67
11	0 44	71	4 44	131	8 44	191	12 44	251	16 44	311	20 44	11	0 44	11	0.73
12	0 48	72	4 48	132	8 48	192	12 48	252	16 48	312	20 48	12	0 48	12	0.80
13	0 52	73	4 52	133	8 52	193	12 52	253	16 52	313	20 52	13	0 52	13	0.87
14	0 56	74	4 56	134	8 56	194	12 56	254	16 56	314	20 56	14	0 56	14	0.93
15	1 0	75	5 0	135	9 0	195	13 0	255	17 0	315	21 0	15	1 0	15	1.00
16	1 4	76	5 4	136	9 4	196	13 4	256	17 4	316	21 4	16	1 4	16	1.07
17	1 8	77	5 8	137	9 8	197	13 8	257	17 8	317	21 8	17	1 8	17	1.13
18	1 12	78	5 12	138	9 12	198	13 12	258	17 12	318	21 12	18	1 12	18	1.20
19	1 16	79	5 16	139	9 16	199	13 16	259	17 16	319	21 16	19	1 16	19	1.27
20	1 20	80	5 20	140	9 20	200	13 20	260	17 20	320	21 20	20	1 20	20	1.33
21	1 24	81	5 24	141	9 24	201	13 24	261	17 24	321	21 24	21	1 24	21	1.40
22	1 28	82	5 28	142	9 28	202	13 28	262	17 28	322	21 28	22	1 28	22	1.47
23	1 32	83	5 32	143	9 32	203	13 32	263	17 32	323	21 32	23	1 32	23	1.53
24	1 36	84	5 36	144	9 36	204	13 36	264	17 36	324	21 36	24	1 36	24	1.60
25	1 40	85	5 40	145	9 40	205	13 40	265	17 40	325	21 40	25	1 40	25	1.67
26	1 44	86	5 44	146	9 44	206	13 44	266	17 44	326	21 44	26	1 44	26	1.73
27	1 48	87	5 48	147	9 48	207	13 48	267	17 48	327	21 48	27	1 48	27	1.80
28	1 52	88	5 52	148	9 52	208	13 52	268	17 52	328	21 52	28	1 52	28	1.87
29	1 56	89	5 56	149	9 56	209	13 56	269	17 56	329	21 56	29	1 56	29	1.93
30	2 0	90	6 0	150	10 0	210	14 0	270	18 0	330	22 0	30	2 0	30	2.00
31	2 4	91	6 4	151	10 4	211	14 4	271	18 4	331	22 4	31	2 4	31	2.07
32	2 8	92	6 8	152	10 8	212	14 8	272	18 8	332	22 8	32	2 8	32	2.13
33	2 12	93	6 12	153	10 12	213	14 12	273	18 12	333	22 12	33	2 12	33	2.20
34	2 16	94	6 16	154	10 16	214	14 16	274	18 16	334	22 16	34	2 16	34	2.27
35	2 20	95	6 20	155	10 20	215	14 20	275	18 20	335	22 20	35	2 20	35	2.33
36	2 24	96	6 24	156	10 24	216	14 24	276	18 24	336	22 24	36	2 24	36	2.40
37	2 28	97	6 28	157	10 28	217	14 28	277	18 28	337	22 28	37	2 28	37	2.47
38	2 32	98	6 32	158	10 32	218	14 32	278	18 32	338	22 32	38	2 32	38	2.53
39	2 36	99	6 36	159	10 36	219	14 36	279	18 36	339	22 36	39	2 36	39	2.60
40	2 40	100	6 40	160	10 40	220	14 40	280	18 40	340	22 40	40	2 40	40	2.67
41	2 44	101	6 44	161	10 44	221	14 44	281	18 44	341	22 44	41	2 44	41	2.73
42	2 48	102	6 48	162	10 48	222	14 48	282	18 48	342	22 48	42	2 48	42	2.80
43	2 52	103	6 52	163	10 52	223	14 52	283	18 52	343	22 52	43	2 52	43	2.87
44	2 56	104	6 56	164	10 56	224	14 56	284	18 56	344	22 56	44	2 56	44	2.93
45	3 0	105	7 0	165	11 0	225	15 0	285	19 0	345	23 0	45	3 0	45	3.00
46	3 4	106	7 4	166	11 4	226	15 4	286	19 4	346	23 4	46	3 4	46	3.07
47	3 8	107	7 8	167	11 8	227	15 8	287	19 8	347	23 8	47	3 8	47	3.13
48	3 12	108	7 12	168	11 12	228	15 12	288	19 12	348	23 12	48	3 12	48	3.20
49	3 16	109	7 16	169	11 16	229	15 16	289	19 16	349	23 16	49	3 16	49	3.27
50	3 20	110	7 20	170	11 20	230	15 20	290	19 20	350	23 20	50	3 20	50	3.33
51	3 24	111	7 24	171	11 24	231	15 24	291	19 24	351	23 24	51	3 24	51	3.40
52	3 28	112	7 28	172	11 28	232	15 28	292	19 28	352	23 28	52	3 28	52	3.47
53	3 32	113	7 32	173	11 32	233	15 32	293	19 32	353	23 32	53	3 32	53	3.53
54	3 36	114	7 36	174	11 36	234	15 36	294	19 36	354	23 36	54	3 36	54	3.60
55	3 40	115	7 40	175	11 40	235	15 40	295	19 40	355	23 40	55	3 40	55	3.67
56	3 44	116	7 44	176	11 44	236	15 44	296	19 44	356	23 44	56	3 44	56	3.73
57	3 48	117	7 48	177	11 48	237	15 48	297	19 48	357	23 48	57	3 48	57	3.80
58	3 52	118	7 52	178	11 52	238	15 52	298	19 52	358	23 52	58	3 52	58	3.87
59	3 56	119	7 56	179	11 56	239	15 56	299	19 56	359	23 56	59	3 56	59	3.93
60	4 0	120	8 0	180	12 0	240	16 0	300	20 0	360	24 0	60	4 0	60	4.00

[When the sign is plus, Polaris is east of north; when the sign is minus, it is west of north]

LHA♈ \ Lat.	+10°	+15°	+20°	+25°	+30°	+35°	+40°	+45°	+50°	+55°	+60°	+65°	+70°
°	°	°	°	°	°	°	°	°	°	°	°	°	°
0	+0.4	+0.5	+0.5	+0.5	+0.5	+0.5	+0.6	+0.6	+0.7	+0.8	+0.9	+1.1	+1.3
10	0.3	0.3	0.3	0.3	0.3	0.4	0.4	0.4	0.5	0.5	0.6	0.7	0.9
20	+0.1	+0.1	+0.1	+0.1	+0.1	+0.2	+0.2	+0.2	+0.2	+0.2	+0.3	+0.3	+0.4
30	0.0	0.0	0.0	0.0	−0.1	−0.1	−0.1	−0.1	−0.1	−0.1	−0.1	−0.1	−0.1
40	−0.2	−0.2	−0.2	−0.2	−0.2	−0.3	−0.3	−0.3	−0.3	−0.4	−0.4	−0.5	−0.6
50	0.4	0.4	0.4	0.4	0.4	0.5	0.5	0.5	0.6	0.7	0.8	0.9	1.1
60	0.5	0.5	0.6	0.6	0.6	0.6	0.7	0.7	0.8	0.9	1.1	1.3	1.6
70	0.7	0.7	0.7	0.7	0.8	0.8	0.9	0.9	1.0	1.2	1.3	1.6	2.0
80	−0.8	−0.8	−0.8	−0.8	−0.9	−0.9	−1.0	−1.1	−1.2	−1.4	−1.6	−1.8	−2.3
90	0.9	0.9	0.9	0.9	1.0	1.0	1.1	1.2	1.3	1.5	1.7	2.1	2.5
100	0.9	1.0	1.0	1.0	1.1	1.1	1.2	1.3	1.4	1.6	1.9	2.2	2.7
110	1.0	1.0	1.0	1.1	1.1	1.2	1.2	1.4	1.5	1.7	1.9	2.3	2.8
120	−1.0	−1.0	−1.0	−1.1	−1.1	−1.2	−1.3	−1.4	−1.5	−1.7	−1.9	−2.3	−2.8
130	1.0	1.0	1.0	1.0	1.1	1.1	1.2	1.3	1.5	1.6	1.9	2.2	2.7
140	0.9	0.9	0.9	1.0	1.0	1.1	1.2	1.2	1.4	1.5	1.8	2.1	2.5
150	0.8	0.8	0.9	0.9	0.9	1.0	1.0	1.1	1.2	1.4	1.6	1.9	2.3
160	−0.7	−0.7	−0.8	−0.8	−0.8	−0.9	−0.9	−1.0	−1.1	−1.2	−1.4	−1.6	−2.0
170	0.6	0.6	0.6	0.6	0.7	0.7	0.8	0.8	0.9	1.0	1.1	1.3	1.6
180	0.4	0.5	0.5	0.5	0.5	0.5	0.6	0.6	0.7	0.8	0.9	1.0	1.2
190	0.3	0.3	0.3	0.3	0.3	0.3	0.4	0.4	0.4	0.5	0.6	0.7	0.8
200	−0.1	−0.1	−0.1	−0.1	−0.1	−0.1	−0.2	−0.2	−0.2	−0.2	−0.2	−0.3	−0.3
210	0.0	0.0	0.0	0.0	+0.1	+0.1	+0.1	+0.1	+0.1	+0.1	+0.1	+0.1	+0.1
220	+0.2	+0.2	+0.2	+0.2	0.2	0.3	0.3	0.3	0.3	0.4	0.4	0.5	0.6
230	0.4	0.4	0.4	0.4	0.4	0.4	0.5	0.5	0.6	0.6	0.7	0.8	1.0
240	+0.5	+0.5	+0.6	+0.6	+0.6	+0.6	+0.7	+0.7	+0.8	+0.9	+1.0	+1.2	+1.5
250	0.7	0.7	0.7	0.7	0.7	0.8	0.8	0.9	1.0	1.1	1.3	1.5	1.8
260	0.8	0.8	0.8	0.8	0.9	0.9	1.0	1.1	1.2	1.3	1.5	1.8	2.2
270	0.9	0.9	0.9	0.9	1.0	1.0	1.1	1.2	1.3	1.5	1.7	2.0	2.4
280	+0.9	+0.9	+1.0	+1.0	+1.1	+1.1	+1.2	+1.3	+1.4	+1.6	+1.8	+2.1	+2.6
290	1.0	1.0	1.0	1.0	1.1	1.2	1.2	1.3	1.5	1.7	1.9	2.2	2.8
300	1.0	1.0	1.0	1.1	1.1	1.2	1.3	1.4	1.5	1.7	1.9	2.3	2.8
310	1.0	1.0	1.0	1.0	1.1	1.1	1.2	1.3	1.5	1.6	1.9	2.2	2.8
320	+0.9	+0.9	+0.9	+1.0	+1.0	+1.1	+1.2	+1.3	+1.4	+1.6	+1.8	+2.1	+2.6
330	0.8	0.8	0.9	0.9	0.9	1.0	1.1	1.2	1.3	1.4	1.6	1.9	2.4
340	0.7	0.7	0.8	0.8	0.8	0.9	0.9	1.0	1.1	1.3	1.4	1.7	2.1
350	0.6	0.6	0.6	0.6	0.7	0.7	0.8	0.8	0.9	1.0	1.2	1.4	1.8
360	+0.4	+0.5	+0.5	+0.5	+0.5	+0.5	+0.6	+0.6	+0.7	+0.8	+0.9	+1.1	+1.3

FIRST CORRECTION TO CORRECTED ALTITUDE

LHA T	Corr.	LHA T	Corr.	LHA T	Corr.	LHA T	Corr.	LHA T	Corr.	LHA T	Corr.
°	′	°	′	°	′	°	′	°	′	°	′
0	−51.1	60	−48.4	120	+ 3.2	180	+51.3	240	+48.7	300	− 2.2
1	51.6	61	47.8	121	4.2	181	51.8	241	48.1	301	3.2
2	52.0	62	47.3	122	5.2	182	52.2	242	47.6	302	4.2
3	52.5	63	46.7	123	6.2	183	52.6	243	47.0	303	5.2
4	52.9	64	46.1	124	7.2	184	53.0	244	46.4	304	6.2
5	−53.3	65	−45.5	125	+ 8.2	185	+53.4	245	+45.8	305	− 7.2
6	53.7	66	44.8	126	9.2	186	53.8	246	45.2	306	8.2
7	54.0	67	44.2	127	10.2	187	54.1	247	44.6	307	9.2
8	54.4	68	43.6	128	11.1	188	54.5	248	44.0	308	10.2
9	54.7	69	42.9	129	12.1	189	54.8	249	43.3	309	11.2
10	−55.0	70	−42.2	130	+13.1	190	+55.1	250	+42.6	310	−12.2
11	55.3	71	41.5	131	14.1	191	55.4	251	42.0	311	13.2
12	55.6	72	40.8	132	15.1	192	55.6	252	41.2	312	14.2
13	55.9	73	40.1	133	16.0	193	55.9	253	40.5	313	15.1
14	56.1	74	39.3	134	17.0	194	56.1	254	39.8	314	16.1
15	−56.3	75	−38.6	135	+18.0	195	+56.4	255	+39.1	315	−17.1
16	56.5	76	37.8	136	18.9	196	56.6	256	38.4	316	18.0
17	56.7	77	37.0	137	19.8	197	56.8	257	37.6	317	19.0
18	56.9	78	36.3	138	20.8	198	56.9	258	36.8	318	20.0
19	57.1	79	35.5	139	21.7	199	57.1	259	36.0	319	20.9
20	−57.2	80	−34.7	140	+22.6	200	+57.2	260	+35.3	320	−21.8
21	57.3	81	33.8	141	23.6	201	57.3	261	34.5	321	22.8
22	57.4	82	33.0	142	24.5	202	57.4	262	33.7	322	23.7
23	57.5	83	32.2	143	25.4	203	57.5	263	32.9	323	24.6
24	57.6	84	31.3	144	26.3	204	57.6	264	32.0	324	25.5
25	−57.6	85	−30.5	145	+27.2	205	+57.6	265	+31.2	325	−26.4
26	57.7	86	29.6	146	28.0	206	57.7	266	30.3	326	27.3
27	57.7	87	28.7	147	28.9	207	57.7	267	29.5	327	28.2
28	57.7	88	27.9	148	29.8	208	57.7	268	28.6	328	29.1
29	57.7	89	27.0	149	30.6	209	57.6	269	27.8	329	29.9
30	−57.6	90	−26.1	150	+31.5	210	+57.6	270	+26.9	330	−30.8
31	57.5	91	25.2	151	32.3	211	57.6	271	26.0	331	31.6
32	57.5	92	24.3	152	33.1	212	57.5	272	25.1	332	32.5
33	57.4	93	23.3	153	34.0	213	57.4	273	24.2	333	33.3
34	57.3	94	22.4	154	34.8	214	57.3	274	23.2	334	34.1
35	−57.2	95	−21.5	155	+35.5	215	+57.2	275	+22.3	335	−34.9
36	57.0	96	20.5	156	36.3	216	57.0	276	21.4	336	35.8
37	56.8	97	19.6	157	37.1	217	56.9	277	20.4	337	36.5
38	56.7	98	18.7	158	37.8	218	56.7	278	19.5	338	37.3
39	56.5	99	17.7	159	38.6	219	56.5	279	18.6	339	38.1
40	−56.2	100	−16.7	160	+39.3	220	+56.3	280	+17.6	340	−38.8
41	56.0	101	15.8	161	40.1	221	56.1	281	16.7	341	39.6
42	55.8	102	14.8	162	40.8	222	55.8	282	15.7	342	40.3
43	55.5	103	13.8	163	41.5	223	55.6	283	14.7	343	41.0
44	55.2	104	12.8	164	42.2	224	55.3	284	13.8	344	41.7
45	−54.9	105	−11.8	165	+42.9	225	+55.0	285	+12.8	345	−42.4
46	54.6	106	10.9	166	43.5	226	54.7	286	11.8	346	43.1
47	54.3	107	9.9	167	44.2	227	54.4	287	10.8	347	43.8
48	53.9	108	8.9	168	44.8	228	54.0	288	9.8	348	44.4
49	53.5	109	7.9	169	45.4	229	53.7	289	8.8	349	45.0
50	−53.1	110	− 6.9	170	+46.0	230	+53.3	290	+ 7.8	350	−45.7
51	52.7	111	5.9	171	46.6	231	52.9	291	6.8	351	46.3
52	52.3	112	4.9	172	47.2	232	52.5	292	5.8	352	46.9
53	51.9	113	3.9	173	47.8	233	52.1	293	4.8	353	47.4
54	51.4	114	2.9	174	48.3	234	51.6	294	3.8	354	48.0
55	−51.0	115	− 1.9	175	+48.9	235	+51.2	295	+ 2.8	355	−48.6
56	50.5	116	− 0.9	176	49.4	236	50.7	296	1.8	356	49.1
57	50.0	117	+ 0.2	177	49.9	237	50.2	297	+ 0.8	357	49.7
58	49.5	118	1.2	178	50.4	238	49.7	298	− 0.2	358	50.2
59	49.0	119	2.2	179	50.8	239	49.2	299	1.2	359	50.6
60	−48.4	120	+ 3.2	180	+51.3	240	+48.7	300	− 2.2	360	−51.1

SECOND CORRECTION TO CORRECTED ALTITUDE

LHA♈ \ Date	Jan. 1	Feb. 1	Mar. 1	Apr. 1	May 1	June 1	July 1	Aug. 1	Sept. 1	Oct. 1	Nov. 1	Dec. 1	Dec. 32
°	′	′	′	′	′	′	′	′	′	′	′	′	′
0	+0.1	0.0	−0.1	−0.2	−0.4	−0.4	−0.4	−0.3	−0.1	+0.1	+0.3	+0.4	+0.5
20	+0.1	+0.1	0.0	−0.1	−0.2	−0.4	−0.4	−0.4	−0.2	0.0	+0.2	+0.3	+0.4
40	+0.1	+0.2	+0.1	0.0	−0.1	−0.3	−0.4	−0.4	−0.3	−0.2	0.0	+0.2	+0.3
60	+0.1	+0.2	+0.2	+0.1	0.0	−0.2	−0.3	−0.3	−0.3	−0.3	−0.1	+0.1	+0.2
80	0.0	+0.2	+0.2	+0.2	+0.1	0.0	−0.2	−0.3	−0.3	−0.3	−0.2	−0.1	+0.1
100	0.0	+0.2	+0.3	+0.3	+0.3	+0.1	0.0	−0.2	−0.3	−0.4	−0.3	−0.2	−0.1
120	0.0	+0.1	+0.3	+0.4	+0.4	+0.3	+0.1	−0.1	−0.2	−0.3	−0.4	−0.3	−0.2
140	−0.1	+0.1	+0.2	+0.3	+0.4	+0.4	+0.2	+0.1	−0.1	−0.3	−0.4	−0.4	−0.4
160	−0.1	0.0	+0.1	+0.3	+0.4	+0.4	+0.3	+0.2	0.0	−0.2	−0.3	−0.4	−0.4
180	−0.1	0.0	+0.1	+0.2	+0.4	+0.4	+0.4	+0.3	+0.1	−0.1	−0.3	−0.4	−0.5
200	−0.1	−0.1	0.0	+0.1	+0.2	+0.4	+0.4	+0.4	+0.2	0.0	−0.2	−0.3	−0.4
220	−0.1	−0.2	−0.1	0.0	+0.1	+0.3	+0.4	+0.4	+0.3	+0.2	0.0	−0.2	−0.4
240	−0.1	−0.2	−0.2	−0.1	0.0	+0.2	+0.3	+0.3	+0.3	+0.3	+0.1	−0.1	−0.2
260	0.0	−0.2	−0.2	−0.2	−0.1	0.0	+0.2	+0.3	+0.3	+0.3	+0.2	+0.1	−0.1
280	0.0	−0.2	−0.3	−0.3	−0.3	−0.1	0.0	+0.2	+0.3	+0.4	+0.3	+0.2	+0.1
300	0.0	−0.1	−0.3	−0.4	−0.4	−0.3	−0.1	+0.1	+0.2	+0.3	+0.4	+0.3	+0.2
320	+0.1	−0.1	−0.2	−0.3	−0.4	−0.4	−0.2	−0.1	+0.1	+0.3	+0.4	+0.4	+0.3
340	+0.1	0.0	−0.1	−0.3	−0.4	−0.4	−0.3	−0.2	0.0	+0.2	+0.3	+0.4	+0.4
360	+0.1	0.0	−0.1	−0.2	−0.4	−0.4	−0.4	−0.3	−0.1	+0.1	+0.3	+0.4	+0.5

LATITUDE BY POLARIS, 1951

THIRD CORRECTION TO CORRECTED ALTITUDE

LHA♈ \ Altitude	10°	15°	20°	25°	30°	35°	40°	45°	50°	55°	60°	65°	70°
°	′	′	′	′	′	′	′	′	′	′	′	′	′
0	−0.1	−0.1	−0.1	−0.1	0.0	0.0	0.0	0.0	0.0	0.0	+0.1	+0.1	+0.2
20	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
40	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
60	−0.1	−0.1	−0.1	−0.1	−0.1	0.0	0.0	0.0	0.0	+0.1	+0.1	+0.2	+0.3
80	−0.2	−0.2	−0.2	−0.2	−0.1	−0.1	0.0	0.0	+0.1	+0.1	+0.2	+0.4	+0.5
100	−0.4	−0.3	−0.3	−0.2	−0.2	−0.1	−0.1	0.0	+0.1	+0.2	+0.3	+0.5	+0.8
120	−0.4	−0.4	−0.3	−0.3	−0.2	−0.1	−0.1	0.0	+0.1	+0.2	+0.3	+0.6	+0.8
140	−0.3	−0.3	−0.3	−0.2	−0.2	−0.1	−0.1	0.0	+0.1	+0.2	+0.3	+0.5	+0.7
160	−0.2	−0.2	−0.2	−0.1	−0.1	−0.1	0.0	0.0	0.0	+0.1	+0.2	+0.3	+0.5
180	−0.1	−0.1	−0.1	−0.1	0.0	0.0	0.0	0.0	0.0	0.0	+0.1	+0.1	+0.2
200	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
220	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
240	−0.1	−0.1	−0.1	−0.1	−0.1	0.0	0.0	0.0	0.0	+0.1	+0.1	+0.2	+0.3
260	−0.2	−0.2	−0.2	−0.2	−0.1	−0.1	0.0	0.0	+0.1	+0.1	+0.2	+0.4	+0.5
280	−0.4	−0.3	−0.3	−0.2	−0.2	−0.1	−0.1	0.0	+0.1	+0.2	+0.3	+0.5	+0.8
300	−0.4	−0.4	−0.3	−0.3	−0.2	−0.1	−0.1	0.0	+0.1	+0.2	+0.3	+0.6	+0.8
320	−0.3	−0.3	−0.3	−0.2	−0.2	−0.1	−0.1	0.0	+0.1	+0.2	+0.3	+0.5	+0.7
340	−0.2	−0.2	−0.2	−0.1	−0.1	−0.1	0.0	0.0	0.0	+0.1	+0.2	+0.3	+0.5
360	−0.1	−0.1	−0.1	−0.1	0.0	0.0	0.0	0.0	0.0	0.0	+0.1	+0.1	+0.2

833190°—50——17

0m

Sec.	SUN PLANET	♈	MOON	code	corr'n	code	corr'n	code	corr'n
	° ′	° ′	° ′		′		′		′
0	0 00.0	0 00.0	0 00.0	0	0.0	60	0.1	120	0.1
1	0 00.3	0 00.3	0 00.2	1	0.0	61	0.1	121	0.1
2	0 00.5	0 00.5	0 00.5	2	0.0	62	0.1	122	0.1
3	0 00.8	0 00.8	0 00.7	3	0.0	63	0.1	123	0.1
4	0 01.0	0 01.0	0 01.0	4	0.0	64	0.1	124	0.1
5	0 01.3	0 01.3	0 01.2	5	0.0	65	0.1	125	0.1
6	0 01.5	0 01.5	0 01.4	6	0.0	66	0.1	126	0.1
7	0 01.8	0 01.8	0 01.7	7	0.0	67	0.1	127	0.1
8	0 02.0	0 02.0	0 01.9	8	0.0	68	0.1	128	0.1
9	0 02.3	0 02.3	0 02.1	9	0.0	69	0.1	129	0.1
10	0 02.5	0 02.5	0 02.4	10	0.0	70	0.1	130	0.1
11	0 02.8	0 02.8	0 02.6	11	0.0	71	0.1	131	0.1
12	0 03.0	0 03.0	0 02.9	12	0.0	72	0.1	132	0.1
13	0 03.3	0 03.3	0 03.1	13	0.0	73	0.1	133	0.1
14	0 03.5	0 03.5	0 03.3	14	0.0	74	0.1	134	0.1
15	0 03.8	0 03.8	0 03.6	15	0.0	75	0.1	135	0.1
16	0 04.0	0 04.0	0 03.8	16	0.0	76	0.1	136	0.1
17	0 04.3	0 04.3	0 04.1	17	0.0	77	0.1	137	0.1
18	0 04.5	0 04.5	0 04.3	18	0.0	78	0.1	138	0.1
19	0 04.8	0 04.8	0 04.5	19	0.0	79	0.1	139	0.1
20	0 05.0	0 05.0	0 04.8	20	0.0	80	0.1	140	0.1
21	0 05.3	0 05.3	0 05.0	21	0.0	81	0.1	141	0.1
22	0 05.5	0 05.5	0 05.2	22	0.0	82	0.1	142	0.1
23	0 05.8	0 05.8	0 05.5	23	0.0	83	0.1	143	0.1
24	0 06.0	0 06.0	0 05.7	24	0.0	84	0.1	144	0.1
25	0 06.3	0 06.3	0 06.0	25	0.0	85	0.1	145	0.1
26	0 06.5	0 06.5	0 06.2	26	0.0	86	0.1	146	0.1
27	0 06.8	0 06.8	0 06.4	27	0.0	87	0.1	147	0.1
28	0 07.0	0 07.0	0 06.7	28	0.0	88	0.1	148	0.1
29	0 07.3	0 07.3	0 06.9	29	0.0	89	0.1	149	0.1
30	0 07.5	0 07.5	0 07.2	30	0.0	90	0.1	150	0.1
31	0 07.8	0 07.8	0 07.4	31	0.0	91	0.1	151	0.1
32	0 08.0	0 08.0	0 07.6	32	0.0	92	0.1	152	0.1
33	0 08.3	0 08.3	0 07.9	33	0.0	93	0.1	153	0.1
34	0 08.5	0 08.5	0 08.1	34	0.0	94	0.1	154	0.1
35	0 08.8	0 08.8	0 08.4	35	0.0	95	0.1	155	0.1
36	0 09.0	0 09.0	0 08.6	36	0.0	96	0.1	156	0.1
37	0 09.3	0 09.3	0 08.8	37	0.0	97	0.1	157	0.1
38	0 09.5	0 09.5	0 09.1	38	0.0	98	0.1	158	0.1
39	0 09.8	0 09.8	0 09.3	39	0.0	99	0.1	159	0.1
40	0 10.0	0 10.0	0 09.5	40	0.0	100	0.1	160	0.1
41	0 10.3	0 10.3	0 09.8	41	0.0	101	0.1	161	0.1
42	0 10.5	0 10.5	0 10.0	42	0.0	102	0.1	162	0.1
43	0 10.8	0 10.8	0 10.3	43	0.0	103	0.1	163	0.1
44	0 11.0	0 11.0	0 10.5	44	0.0	104	0.1	164	0.1
45	0 11.3	0 11.3	0 10.7	45	0.0	105	0.1	165	0.1
46	0 11.5	0 11.5	0 11.0	46	0.0	106	0.1	166	0.1
47	0 11.8	0 11.8	0 11.2	47	0.0	107	0.1	167	0.1
48	0 12.0	0 12.0	0 11.5	48	0.0	108	0.1	168	0.1
49	0 12.3	0 12.3	0 11.7	49	0.0	109	0.1	169	0.1
50	0 12.5	0 12.5	0 11.9	50	0.0	110	0.1	170	0.1
51	0 12.8	0 12.8	0 12.2	51	0.0	111	0.1	171	0.1
52	0 13.0	0 13.0	0 12.4	52	0.0	112	0.1	172	0.1
53	0 13.3	0 13.3	0 12.6	53	0.0	113	0.1	173	0.1
54	0 13.5	0 13.5	0 12.9	54	0.0	114	0.1	174	0.1
55	0 13.8	0 13.8	0 13.1	55	0.0	115	0.1	175	0.1
56	0 14.0	0 14.0	0 13.4	56	0.0	116	0.1	176	0.1
57	0 14.3	0 14.3	0 13.6	57	0.0	117	0.1	177	0.1
58	0 14.5	0 14.5	0 13.8	58	0.0	118	0.1	178	0.1
59	0 14.8	0 14.8	0 14.1	59	0.0	119	0.1	179	0.1
60	0 15.0	0 15.0	0 14.3	60	0.1	120	0.1	180	0.2

1m

Sec.	SUN PLANET	♈	MOON	code	corr'n	code	corr'n	code	corr'n
	° ′	° ′	° ′		′		′		′
0	0 15.0	0 15.0	0 14.3	0	0.0	60	0.2	120	0.3
1	0 15.3	0 15.3	0 14.6	1	0.0	61	0.2	121	0.3
2	0 15.5	0 15.5	0 14.8	2	0.0	62	0.2	122	0.3
3	0 15.8	0 15.8	0 15.0	3	0.0	63	0.2	123	0.3
4	0 16.0	0 16.0	0 15.3	4	0.0	64	0.2	124	0.3
5	0 16.3	0 16.3	0 15.5	5	0.0	65	0.2	125	0.3
6	0 16.5	0 16.5	0 15.7	6	0.0	66	0.2	126	0.3
7	0 16.8	0 16.8	0 16.0	7	0.0	67	0.2	127	0.3
8	0 17.0	0 17.0	0 16.2	8	0.0	68	0.2	128	0.3
9	0 17.3	0 17.3	0 16.5	9	0.0	69	0.2	129	0.3
10	0 17.5	0 17.5	0 16.7	10	0.0	70	0.2	130	0.3
11	0 17.8	0 17.8	0 16.9	11	0.0	71	0.2	131	0.3
12	0 18.0	0 18.0	0 17.2	12	0.0	72	0.2	132	0.3
13	0 18.3	0 18.3	0 17.4	13	0.0	73	0.2	133	0.3
14	0 18.5	0 18.6	0 17.7	14	0.0	74	0.2	134	0.3
15	0 18.8	0 18.8	0 17.9	15	0.0	75	0.2	135	0.3
16	0 19.0	0 19.1	0 18.1	16	0.0	76	0.2	136	0.3
17	0 19.3	0 19.3	0 18.4	17	0.0	77	0.2	137	0.3
18	0 19.5	0 19.6	0 18.6	18	0.0	78	0.2	138	0.3
19	0 19.8	0 19.8	0 18.9	19	0.0	79	0.2	139	0.3
20	0 20.0	0 20.1	0 19.1	20	0.1	80	0.2	140	0.4
21	0 20.3	0 20.3	0 19.3	21	0.1	81	0.2	141	0.4
22	0 20.5	0 20.6	0 19.6	22	0.1	82	0.2	142	0.4
23	0 20.8	0 20.8	0 19.8	23	0.1	83	0.2	143	0.4
24	0 21.0	0 21.1	0 20.0	24	0.1	84	0.2	144	0.4
25	0 21.3	0 21.3	0 20.3	25	0.1	85	0.2	145	0.4
26	0 21.5	0 21.6	0 20.5	26	0.1	86	0.2	146	0.4
27	0 21.8	0 21.8	0 20.8	27	0.1	87	0.2	147	0.4
28	0 22.0	0 22.1	0 21.0	28	0.1	88	0.2	148	0.4
29	0 22.3	0 22.3	0 21.2	29	0.1	89	0.2	149	0.4
30	0 22.5	0 22.6	0 21.5	30	0.1	90	0.2	150	0.4
31	0 22.8	0 22.8	0 21.7	31	0.1	91	0.2	151	0.4
32	0 23.0	0 23.1	0 22.0	32	0.1	92	0.2	152	0.4
33	0 23.3	0 23.3	0 22.2	33	0.1	93	0.2	153	0.4
34	0 23.5	0 23.6	0 22.4	34	0.1	94	0.2	154	0.4
35	0 23.8	0 23.8	0 22.7	35	0.1	95	0.2	155	0.4
36	0 24.0	0 24.1	0 22.9	36	0.1	96	0.2	156	0.4
37	0 24.3	0 24.3	0 23.1	37	0.1	97	0.2	157	0.4
38	0 24.5	0 24.6	0 23.4	38	0.1	98	0.2	158	0.4
39	0 24.8	0 24.8	0 23.6	39	0.1	99	0.2	159	0.4
40	0 25.0	0 25.1	0 23.9	40	0.1	100	0.3	160	0.4
41	0 25.3	0 25.3	0 24.1	41	0.1	101	0.3	161	0.4
42	0 25.5	0 25.6	0 24.3	42	0.1	102	0.3	162	0.4
43	0 25.8	0 25.8	0 24.6	43	0.1	103	0.3	163	0.4
44	0 26.0	0 26.1	0 24.8	44	0.1	104	0.3	164	0.4
45	0 26.3	0 26.3	0 25.1	45	0.1	105	0.3	165	0.4
46	0 26.5	0 26.6	0 25.3	46	0.1	106	0.3	166	0.4
47	0 26.8	0 26.8	0 25.5	47	0.1	107	0.3	167	0.4
48	0 27.0	0 27.1	0 25.8	48	0.1	108	0.3	168	0.4
49	0 27.3	0 27.3	0 26.0	49	0.1	109	0.3	169	0.4
50	0 27.5	0 27.6	0 26.2	50	0.1	110	0.3	170	0.4
51	0 27.8	0 27.8	0 26.5	51	0.1	111	0.3	171	0.4
52	0 28.0	0 28.1	0 26.7	52	0.1	112	0.3	172	0.4
53	0 28.3	0 28.3	0 27.0	53	0.1	113	0.3	173	0.4
54	0 28.5	0 28.6	0 27.2	54	0.1	114	0.3	174	0.4
55	0 28.8	0 28.8	0 27.4	55	0.1	115	0.3	175	0.4
56	0 29.0	0 29.1	0 27.7	56	0.1	116	0.3	176	0.4
57	0 29.3	0 29.3	0 27.9	57	0.1	117	0.3	177	0.4
58	0 29.5	0 29.6	0 28.2	58	0.1	118	0.3	178	0.4
59	0 29.8	0 29.8	0 28.4	59	0.1	119	0.3	179	0.4
60	0 30.0	0 30.1	0 28.6	60	0.2	120	0.3	180	0.5

2m

Sec.	SUN PLANET	♈	MOON	code	corr'n	code	corr'n	code	corr'n
	° ′	° ′	° ′		′		′		′
0	0 30.0	0 30.1	0 28.6	0	0.0	60	0.3	120	0.5
1	0 30.3	0 30.3	0 28.9	1	0.0	61	0.3	121	0.5
2	0 30.5	0 30.6	0 29.1	2	0.0	62	0.3	122	0.5
3	0 30.8	0 30.8	0 29.3	3	0.0	63	0.3	123	0.5
4	0 31.0	0 31.1	0 29.6	4	0.0	64	0.3	124	0.5
5	0 31.3	0 31.3	0 29.8	5	0.0	65	0.3	125	0.5
6	0 31.5	0 31.6	0 30.1	6	0.0	66	0.3	126	0.5
7	0 31.8	0 31.8	0 30.3	7	0.0	67	0.3	127	0.5
8	0 32.0	0 32.1	0 30.5	8	0.0	68	0.3	128	0.5
9	0 32.3	0 32.3	0 30.8	9	0.0	69	0.3	129	0.5
10	0 32.5	0 32.6	0 31.0	10	0.0	70	0.3	130	0.5
11	0 32.8	0 32.8	0 31.3	11	0.0	71	0.3	131	0.5
12	0 33.0	0 33.1	0 31.5	12	0.1	72	0.3	132	0.6
13	0 33.3	0 33.3	0 31.7	13	0.1	73	0.3	133	0.6
14	0 33.5	0 33.6	0 32.0	14	0.1	74	0.3	134	0.6
15	0 33.8	0 33.8	0 32.2	15	0.1	75	0.3	135	0.6
16	0 34.0	0 34.1	0 32.5	16	0.1	76	0.3	136	0.6
17	0 34.3	0 34.3	0 32.7	17	0.1	77	0.3	137	0.6
18	0 34.5	0 34.6	0 32.9	18	0.1	78	0.3	138	0.6
19	0 34.8	0 34.8	0 33.2	19	0.1	79	0.3	139	0.6
20	0 35.0	0 35.1	0 33.4	20	0.1	80	0.3	140	0.6
21	0 35.3	0 35.3	0 33.6	21	0.1	81	0.3	141	0.6
22	0 35.5	0 35.6	0 33.9	22	0.1	82	0.3	142	0.6
23	0 35.8	0 35.8	0 34.1	23	0.1	83	0.3	143	0.6
24	0 36.0	0 36.1	0 34.4	24	0.1	84	0.4	144	0.6
25	0 36.3	0 36.3	0 34.6	25	0.1	85	0.4	145	0.6
26	0 36.5	0 36.6	0 34.8	26	0.1	86	0.4	146	0.6
27	0 36.8	0 36.9	0 35.1	27	0.1	87	0.4	147	0.6
28	0 37.0	0 37.1	0 35.3	28	0.1	88	0.4	148	0.6
29	0 37.3	0 37.4	0 35.6	29	0.1	89	0.4	149	0.6
30	0 37.5	0 37.6	0 35.8	30	0.1	90	0.4	150	0.6
31	0 37.8	0 37.9	0 36.0	31	0.1	91	0.4	151	0.6
32	0 38.0	0 38.1	0 36.3	32	0.1	92	0.4	152	0.6
33	0 38.3	0 38.4	0 36.5	33	0.1	93	0.4	153	0.6
34	0 38.5	0 38.6	0 36.7	34	0.1	94	0.4	154	0.6
35	0 38.8	0 38.9	0 37.0	35	0.1	95	0.4	155	0.6
36	0 39.0	0 39.1	0 37.2	36	0.2	96	0.4	156	0.7
37	0 39.3	0 39.4	0 37.5	37	0.2	97	0.4	157	0.7
38	0 39.5	0 39.6	0 37.7	38	0.2	98	0.4	158	0.7
39	0 39.8	0 39.9	0 37.9	39	0.2	99	0.4	159	0.7
40	0 40.0	0 40.1	0 38.2	40	0.2	100	0.4	160	0.7
41	0 40.3	0 40.4	0 38.4	41	0.2	101	0.4	161	0.7
42	0 40.5	0 40.6	0 38.7	42	0.2	102	0.4	162	0.7
43	0 40.8	0 40.9	0 38.9	43	0.2	103	0.4	163	0.7
44	0 41.0	0 41.1	0 39.1	44	0.2	104	0.4	164	0.7
45	0 41.3	0 41.4	0 39.4	45	0.2	105	0.4	165	0.7
46	0 41.5	0 41.6	0 39.6	46	0.2	106	0.4	166	0.7
47	0 41.8	0 41.9	0 39.8	47	0.2	107	0.4	167	0.7
48	0 42.0	0 42.1	0 40.1	48	0.2	108	0.5	168	0.7
49	0 42.3	0 42.4	0 40.3	49	0.2	109	0.5	169	0.7
50	0 42.5	0 42.6	0 40.6	50	0.2	110	0.5	170	0.7
51	0 42.8	0 42.9	0 40.8	51	0.2	111	0.5	171	0.7
52	0 43.0	0 43.1	0 41.0	52	0.2	112	0.5	172	0.7
53	0 43.3	0 43.4	0 41.3	53	0.2	113	0.5	173	0.7
54	0 43.5	0 43.6	0 41.5	54	0.2	114	0.5	174	0.7
55	0 43.8	0 43.9	0 41.8	55	0.2	115	0.5	175	0.7
56	0 44.0	0 44.1	0 42.0	56	0.2	116	0.5	176	0.7
57	0 44.3	0 44.4	0 42.2	57	0.2	117	0.5	177	0.7
58	0 44.5	0 44.6	0 42.5	58	0.2	118	0.5	178	0.7
59	0 44.8	0 44.9	0 42.7	59	0.2	119	0.5	179	0.7
60	0 45.0	0 45.1	0 43.0	60	0.3	120	0.5	180	0.8

3m

Sec.	SUN PLANET	♈	MOON	code	corr'n	code	corr'n	code	corr'n
	° ′	° ′	° ′		′		′		′
0	0 45.0	0 45.1	0 43.0	0	0.0	60	0.4	120	0.7
1	0 45.3	0 45.4	0 43.2	1	0.0	61	0.4	121	0.7
2	0 45.5	0 45.6	0 43.4	2	0.0	62	0.4	122	0.7
3	0 45.8	0 45.9	0 43.7	3	0.0	63	0.4	123	0.7
4	0 46.0	0 46.1	0 43.9	4	0.0	64	0.4	124	0.7
5	0 46.3	0 46.4	0 44.1	5	0.0	65	0.4	125	0.7
6	0 46.5	0 46.6	0 44.4	6	0.0	66	0.4	126	0.7
7	0 46.8	0 46.9	0 44.6	7	0.0	67	0.4	127	0.7
8	0 47.0	0 47.1	0 44.9	8	0.0	68	0.4	128	0.7
9	0 47.3	0 47.4	0 45.1	9	0.1	69	0.4	129	0.8
10	0 47.5	0 47.6	0 45.3	10	0.1	70	0.4	130	0.8
11	0 47.8	0 47.9	0 45.6	11	0.1	71	0.4	131	0.8
12	0 48.0	0 48.1	0 45.8	12	0.1	72	0.4	132	0.8
13	0 48.3	0 48.4	0 46.1	13	0.1	73	0.4	133	0.8
14	0 48.5	0 48.6	0 46.3	14	0.1	74	0.4	134	0.8
15	0 48.8	0 48.9	0 46.5	15	0.1	75	0.4	135	0.8
16	0 49.0	0 49.1	0 46.8	16	0.1	76	0.4	136	0.8
17	0 49.3	0 49.4	0 47.0	17	0.1	77	0.4	137	0.8
18	0 49.5	0 49.6	0 47.2	18	0.1	78	0.5	138	0.8
19	0 49.8	0 49.9	0 47.5	19	0.1	79	0.5	139	0.8
20	0 50.0	0 50.1	0 47.7	20	0.1	80	0.5	140	0.8
21	0 50.3	0 50.4	0 48.0	21	0.1	81	0.5	141	0.8
22	0 50.5	0 50.6	0 48.2	22	0.1	82	0.5	142	0.8
23	0 50.8	0 50.9	0 48.4	23	0.1	83	0.5	143	0.8
24	0 51.0	0 51.1	0 48.7	24	0.1	84	0.5	144	0.8
25	0 51.3	0 51.4	0 48.9	25	0.1	85	0.5	145	0.8
26	0 51.5	0 51.6	0 49.2	26	0.2	86	0.5	146	0.9
27	0 51.8	0 51.9	0 49.4	27	0.2	87	0.5	147	0.9
28	0 52.0	0 52.1	0 49.6	28	0.2	88	0.5	148	0.9
29	0 52.3	0 52.4	0 49.9	29	0.2	89	0.5	149	0.9
30	0 52.5	0 52.6	0 50.1	30	0.2	90	0.5	150	0.9
31	0 52.8	0 52.9	0 50.3	31	0.2	91	0.5	151	0.9
32	0 53.0	0 53.1	0 50.6	32	0.2	92	0.5	152	0.9
33	0 53.3	0 53.4	0 50.8	33	0.2	93	0.5	153	0.9
34	0 53.5	0 53.6	0 51.1	34	0.2	94	0.5	154	0.9
35	0 53.8	0 53.9	0 51.3	35	0.2	95	0.6	155	0.9
36	0 54.0	0 54.1	0 51.5	36	0.2	96	0.6	156	0.9
37	0 54.3	0 54.4	0 51.8	37	0.2	97	0.6	157	0.9
38	0 54.5	0 54.6	0 52.0	38	0.2	98	0.6	158	0.9
39	0 54.8	0 54.9	0 52.3	39	0.2	99	0.6	159	0.9
40	0 55.0	0 55.2	0 52.5	40	0.2	100	0.6	160	0.9
41	0 55.3	0 55.4	0 52.7	41	0.2	101	0.6	161	0.9
42	0 55.5	0 55.7	0 53.0	42	0.2	102	0.6	162	0.9
43	0 55.8	0 55.9	0 53.2	43	0.3	103	0.6	163	1.0
44	0 56.0	0 56.2	0 53.4	44	0.3	104	0.6	164	1.0
45	0 56.3	0 56.4	0 53.7	45	0.3	105	0.6	165	1.0
46	0 56.5	0 56.7	0 53.9	46	0.3	106	0.6	166	1.0
47	0 56.8	0 56.9	0 54.2	47	0.3	107	0.6	167	1.0
48	0 57.0	0 57.2	0 54.4	48	0.3	108	0.6	168	1.0
49	0 57.3	0 57.4	0 54.6	49	0.3	109	0.6	169	1.0
50	0 57.5	0 57.7	0 54.9	50	0.3	110	0.6	170	1.0
51	0 57.8	0 57.9	0 55.1	51	0.3	111	0.6	171	1.0
52	0 58.0	0 58.2	0 55.4	52	0.3	112	0.7	172	1.0
53	0 58.3	0 58.4	0 55.6	53	0.3	113	0.7	173	1.0
54	0 58.5	0 58.7	0 55.8	54	0.3	114	0.7	174	1.0
55	0 58.8	0 58.9	0 56.1	55	0.3	115	0.7	175	1.0
56	0 59.0	0 59.2	0 56.3	56	0.3	116	0.7	176	1.0
57	0 59.3	0 59.4	0 56.6	57	0.3	117	0.7	177	1.0
58	0 59.5	0 59.7	0 56.8	58	0.3	118	0.7	178	1.0
59	0 59.8	0 59.9	0 57.0	59	0.3	119	0.7	179	1.0
60	1 00.0	1 00.2	0 57.3	60	0.4	120	0.7	180	1.1

4m

Sec.	SUN PLANET	♈	MOON	code	corr'n	code	corr'n	code	corr'n
	° ′	° ′	° ′		′		′		′
0	1 00.0	1 00.2	0 57.3	0	0.0	60	0.5	120	0.9
1	1 00.3	1 00.4	0 57.5	1	0.0	61	0.5	121	0.9
2	1 00.5	1 00.7	0 57.7	2	0.0	62	0.5	122	0.9
3	1 00.8	1 00.9	0 58.0	3	0.0	63	0.5	123	0.9
4	1 01.0	1 01.2	0 58.2	4	0.0	64	0.5	124	0.9
5	1 01.3	1 01.4	0 58.5	5	0.0	65	0.5	125	0.9
6	1 01.5	1 01.7	0 58.7	6	0.0	66	0.5	126	0.9
7	1 01.8	1 01.9	0 58.9	7	0.1	67	0.5	127	1.0
8	1 02.0	1 02.2	0 59.2	8	0.1	68	0.5	128	1.0
9	1 02.3	1 02.4	0 59.4	9	0.1	69	0.5	129	1.0
10	1 02.5	1 02.7	0 59.7	10	0.1	70	0.5	130	1.0
11	1 02.8	1 02.9	0 59.9	11	0.1	71	0.5	131	1.0
12	1 03.0	1 03.2	1 00.1	12	0.1	72	0.5	132	1.0
13	1 03.3	1 03.4	1 00.4	13	0.1	73	0.5	133	1.0
14	1 03.5	1 03.7	1 00.6	14	0.1	74	0.6	134	1.0
15	1 03.8	1 03.9	1 00.8	15	0.1	75	0.6	135	1.0
16	1 04.0	1 04.2	1 01.1	16	0.1	76	0.6	136	1.0
17	1 04.3	1 04.4	1 01.3	17	0.1	77	0.6	137	1.0
18	1 04.5	1 04.7	1 01.6	18	0.1	78	0.6	138	1.0
19	1 04.8	1 04.9	1 01.8	19	0.1	79	0.6	139	1.0
20	1 05.0	1 05.2	1 02.0	20	0.2	80	0.6	140	1.1
21	1 05.3	1 05.4	1 02.3	21	0.2	81	0.6	141	1.1
22	1 05.5	1 05.7	1 02.5	22	0.2	82	0.6	142	1.1
23	1 05.8	1 05.9	1 02.8	23	0.2	83	0.6	143	1.1
24	1 06.0	1 06.2	1 03.0	24	0.2	84	0.6	144	1.1
25	1 06.3	1 06.4	1 03.2	25	0.2	85	0.6	145	1.1
26	1 06.5	1 06.7	1 03.5	26	0.2	86	0.6	146	1.1
27	1 06.8	1 06.9	1 03.7	27	0.2	87	0.7	147	1.1
28	1 07.0	1 07.2	1 03.9	28	0.2	88	0.7	148	1.1
29	1 07.3	1 07.4	1 04.2	29	0.2	89	0.7	149	1.1
30	1 07.5	1 07.7	1 04.4	30	0.2	90	0.7	150	1.1
31	1 07.8	1 07.9	1 04.7	31	0.2	91	0.7	151	1.1
32	1 08.0	1 08.2	1 04.9	32	0.2	92	0.7	152	1.1
33	1 08.3	1 08.4	1 05.1	33	0.2	93	0.7	153	1.1
34	1 08.5	1 08.7	1 05.4	34	0.3	94	0.7	154	1.2
35	1 08.8	1 08.9	1 05.6	35	0.3	95	0.7	155	1.2
36	1 09.0	1 09.2	1 05.9	36	0.3	96	0.7	156	1.2
37	1 09.3	1 09.4	1 06.1	37	0.3	97	0.7	157	1.2
38	1 09.5	1 09.7	1 06.3	38	0.3	98	0.7	158	1.2
39	1 09.8	1 09.9	1 06.6	39	0.3	99	0.7	159	1.2
40	1 10.0	1 10.2	1 06.8	40	0.3	100	0.8	160	1.2
41	1 10.3	1 10.4	1 07.0	41	0.3	101	0.8	161	1.2
42	1 10.5	1 10.7	1 07.3	42	0.3	102	0.8	162	1.2
43	1 10.8	1 10.9	1 07.5	43	0.3	103	0.8	163	1.2
44	1 11.0	1 11.2	1 07.8	44	0.3	104	0.8	164	1.2
45	1 11.3	1 11.4	1 08.0	45	0.3	105	0.8	165	1.2
46	1 11.5	1 11.7	1 08.2	46	0.3	106	0.8	166	1.2
47	1 11.8	1 11.9	1 08.5	47	0.4	107	0.8	167	1.3
48	1 12.0	1 12.2	1 08.7	48	0.4	108	0.8	168	1.3
49	1 12.3	1 12.4	1 09.0	49	0.4	109	0.8	169	1.3
50	1 12.5	1 12.7	1 09.2	50	0.4	110	0.8	170	1.3
51	1 12.8	1 12.9	1 09.4	51	0.4	111	0.8	171	1.3
52	1 13.0	1 13.2	1 09.7	52	0.4	112	0.8	172	1.3
53	1 13.3	1 13.5	1 09.9	53	0.4	113	0.8	173	1.3
54	1 13.5	1 13.7	1 10.2	54	0.4	114	0.9	174	1.3
55	1 13.8	1 14.0	1 10.4	55	0.4	115	0.9	175	1.3
56	1 14.0	1 14.2	1 10.6	56	0.4	116	0.9	176	1.3
57	1 14.3	1 14.5	1 10.9	57	0.4	117	0.9	177	1.3
58	1 14.5	1 14.7	1 11.1	58	0.4	118	0.9	178	1.3
59	1 14.8	1 15.0	1 11.3	59	0.4	119	0.9	179	1.3
60	1 15.0	1 15.2	1 11.6	60	0.5	120	0.9	180	1.4

5m

Sec.	SUN PLANET	♈	MOON	code	corr'n	code	corr'n	code	corr'n
	° ′	° ′	° ′		′		′		′
0	1 15.0	1 15.2	1 11.6	0	0.0	60	0.6	120	1.1
1	1 15.3	1 15.5	1 11.8	1	0.0	61	0.6	121	1.1
2	1 15.5	1 15.7	1 12.1	2	0.0	62	0.6	122	1.1
3	1 15.8	1 16.0	1 12.3	3	0.0	63	0.6	123	1.1
4	1 16.0	1 16.2	1 12.5	4	0.0	64	0.6	124	1.1
5	1 16.3	1 16.5	1 12.8	5	0.0	65	0.6	125	1.1
6	1 16.5	1 16.7	1 13.0	6	0.1	66	0.6	126	1.2
7	1 16.8	1 17.0	1 13.3	7	0.1	67	0.6	127	1.2
8	1 17.0	1 17.2	1 13.5	8	0.1	68	0.6	128	1.2
9	1 17.3	1 17.5	1 13.7	9	0.1	69	0.6	129	1.2
10	1 17.5	1 17.7	1 14.0	10	0.1	70	0.6	130	1.2
11	1 17.8	1 18.0	1 14.2	11	0.1	71	0.7	131	1.2
12	1 18.0	1 18.2	1 14.4	12	0.1	72	0.7	132	1.2
13	1 18.3	1 18.5	1 14.7	13	0.1	73	0.7	133	1.2
14	1 18.5	1 18.7	1 14.9	14	0.1	74	0.7	134	1.2
15	1 18.8	1 19.0	1 15.2	15	0.1	75	0.7	135	1.2
16	1 19.0	1 19.2	1 15.4	16	0.1	76	0.7	136	1.2
17	1 19.3	1 19.5	1 15.6	17	0.2	77	0.7	137	1.3
18	1 19.5	1 19.7	1 15.9	18	0.2	78	0.7	138	1.3
19	1 19.8	1 20.0	1 16.1	19	0.2	79	0.7	139	1.3
20	1 20.0	1 20.2	1 16.4	20	0.2	80	0.7	140	1.3
21	1 20.3	1 20.5	1 16.6	21	0.2	81	0.7	141	1.3
22	1 20.5	1 20.7	1 16.8	22	0.2	82	0.8	142	1.3
23	1 20.8	1 21.0	1 17.1	23	0.2	83	0.8	143	1.3
24	1 21.0	1 21.2	1 17.3	24	0.2	84	0.8	144	1.3
25	1 21.3	1 21.5	1 17.5	25	0.2	85	0.8	145	1.3
26	1 21.5	1 21.7	1 17.8	26	0.2	86	0.8	146	1.3
27	1 21.8	1 22.0	1 18.0	27	0.2	87	0.8	147	1.3
28	1 22.0	1 22.2	1 18.3	28	0.3	88	0.8	148	1.4
29	1 22.3	1 22.5	1 18.5	29	0.3	89	0.8	149	1.4
30	1 22.5	1 22.7	1 18.7	30	0.3	90	0.8	150	1.4
31	1 22.8	1 23.0	1 19.0	31	0.3	91	0.8	151	1.4
32	1 23.0	1 23.2	1 19.2	32	0.3	92	0.8	152	1.4
33	1 23.3	1 23.5	1 19.5	33	0.3	93	0.9	153	1.4
34	1 23.5	1 23.7	1 19.7	34	0.3	94	0.9	154	1.4
35	1 23.8	1 24.0	1 19.9	35	0.3	95	0.9	155	1.4
36	1 24.0	1 24.2	1 20.2	36	0.3	96	0.9	156	1.4
37	1 24.3	1 24.5	1 20.4	37	0.3	97	0.9	157	1.4
38	1 24.5	1 24.7	1 20.7	38	0.3	98	0.9	158	1.4
39	1 24.8	1 25.0	1 20.9	39	0.4	99	0.9	159	1.5
40	1 25.0	1 25.2	1 21.1	40	0.4	100	0.9	160	1.5
41	1 25.3	1 25.5	1 21.4	41	0.4	101	0.9	161	1.5
42	1 25.5	1 25.7	1 21.6	42	0.4	102	0.9	162	1.5
43	1 25.8	1 26.0	1 21.8	43	0.4	103	0.9	163	1.5
44	1 26.0	1 26.2	1 22.1	44	0.4	104	1.0	164	1.5
45	1 26.3	1 26.5	1 22.3	45	0.4	105	1.0	165	1.5
46	1 26.5	1 26.7	1 22.6	46	0.4	106	1.0	166	1.5
47	1 26.8	1 27.0	1 22.8	47	0.4	107	1.0	167	1.5
48	1 27.0	1 27.2	1 23.0	48	0.4	108	1.0	168	1.5
49	1 27.3	1 27.5	1 23.3	49	0.4	109	1.0	169	1.5
50	1 27.5	1 27.7	1 23.5	50	0.5	110	1.0	170	1.6
51	1 27.8	1 28.0	1 23.8	51	0.5	111	1.0	171	1.6
52	1 28.0	1 28.2	1 24.0	52	0.5	112	1.0	172	1.6
53	1 28.3	1 28.5	1 24.2	53	0.5	113	1.0	173	1.6
54	1 28.5	1 28.7	1 24.5	54	0.5	114	1.0	174	1.6
55	1 28.8	1 29.0	1 24.7	55	0.5	115	1.1	175	1.6
56	1 29.0	1 29.2	1 24.9	56	0.5	116	1.1	176	1.6
57	1 29.3	1 29.5	1 25.2	57	0.5	117	1.1	177	1.6
58	1 29.5	1 29.7	1 25.4	58	0.5	118	1.1	178	1.6
59	1 29.8	1 30.0	1 25.7	59	0.5	119	1.1	179	1.6
60	1 30.0	1 30.2	1 25.9	60	0.6	120	1.1	180	1.7

6m

Sec.	SUN PLANET	♈	MOON	code	corr'n	code	corr'n	code	corr'n
	° ′	° ′	° ′		′		′		′
0	1 30.0	1 30.2	1 25.9	0	0.0	60	0.7	120	1.3
1	1 30.3	1 30.5	1 26.1	1	0.0	61	0.7	121	1.3
2	1 30.5	1 30.7	1 26.4	2	0.0	62	0.7	122	1.3
3	1 30.8	1 31.0	1 26.6	3	0.0	63	0.7	123	1.3
4	1 31.0	1 31.2	1 26.9	4	0.0	64	0.7	124	1.3
5	1 31.3	1 31.5	1 27.1	5	0.1	65	0.7	125	1.4
6	1 31.5	1 31.8	1 27.3	6	0.1	66	0.7	126	1.4
7	1 31.8	1 32.0	1 27.6	7	0.1	67	0.7	127	1.4
8	1 32.0	1 32.3	1 27.8	8	0.1	68	0.7	128	1.4
9	1 32.3	1 32.5	1 28.0	9	0.1	69	0.7	129	1.4
10	1 32.5	1 32.8	1 28.3	10	0.1	70	0.8	130	1.4
11	1 32.8	1 33.0	1 28.5	11	0.1	71	0.8	131	1.4
12	1 33.0	1 33.3	1 28.8	12	0.1	72	0.8	132	1.4
13	1 33.3	1 33.5	1 29.0	13	0.1	73	0.8	133	1.4
14	1 33.5	1 33.8	1 29.2	14	0.2	74	0.8	134	1.5
15	1 33.8	1 34.0	1 29.5	15	0.2	75	0.8	135	1.5
16	1 34.0	1 34.3	1 29.7	16	0.2	76	0.8	136	1.5
17	1 34.3	1 34.5	1 30.0	17	0.2	77	0.8	137	1.5
18	1 34.5	1 34.8	1 30.2	18	0.2	78	0.8	138	1.5
19	1 34.8	1 35.0	1 30.4	19	0.2	79	0.9	139	1.5
20	1 35.0	1 35.3	1 30.7	20	0.2	80	0.9	140	1.5
21	1 35.3	1 35.5	1 30.9	21	0.2	81	0.9	141	1.5
22	1 35.5	1 35.8	1 31.1	22	0.2	82	0.9	142	1.5
23	1 35.8	1 36.0	1 31.4	23	0.2	83	0.9	143	1.5
24	1 36.0	1 36.3	1 31.6	24	0.3	84	0.9	144	1.6
25	1 36.3	1 36.5	1 31.9	25	0.3	85	0.9	145	1.6
26	1 36.5	1 36.8	1 32.1	26	0.3	86	0.9	146	1.6
27	1 36.8	1 37.0	1 32.3	27	0.3	87	0.9	147	1.6
28	1 37.0	1 37.3	1 32.6	28	0.3	88	1.0	148	1.6
29	1 37.3	1 37.5	1 32.8	29	0.3	89	1.0	149	1.6
30	1 37.5	1 37.8	1 33.1	30	0.3	90	1.0	150	1.6
31	1 37.8	1 38.0	1 33.3	31	0.3	91	1.0	151	1.6
32	1 38.0	1 38.3	1 33.5	32	0.3	92	1.0	152	1.6
33	1 38.3	1 38.5	1 33.8	33	0.4	93	1.0	153	1.7
34	1 38.5	1 38.8	1 34.0	34	0.4	94	1.0	154	1.7
35	1 38.8	1 39.0	1 34.3	35	0.4	95	1.0	155	1.7
36	1 39.0	1 39.3	1 34.5	36	0.4	96	1.0	156	1.7
37	1 39.3	1 39.5	1 34.7	37	0.4	97	1.1	157	1.7
38	1 39.5	1 39.8	1 35.0	38	0.4	98	1.1	158	1.7
39	1 39.8	1 40.0	1 35.2	39	0.4	99	1.1	159	1.7
40	1 40.0	1 40.3	1 35.4	40	0.4	100	1.1	160	1.7
41	1 40.3	1 40.5	1 35.7	41	0.4	101	1.1	161	1.7
42	1 40.5	1 40.8	1 35.9	42	0.5	102	1.1	162	1.8
43	1 40.8	1 41.0	1 36.2	43	0.5	103	1.1	163	1.8
44	1 41.0	1 41.3	1 36.4	44	0.5	104	1.1	164	1.8
45	1 41.3	1 41.5	1 36.6	45	0.5	105	1.1	165	1.8
46	1 41.5	1 41.8	1 36.9	46	0.5	106	1.1	166	1.8
47	1 41.8	1 42.0	1 37.1	47	0.5	107	1.2	167	1.8
48	1 42.0	1 42.3	1 37.4	48	0.5	108	1.2	168	1.8
49	1 42.3	1 42.5	1 37.6	49	0.5	109	1.2	169	1.8
50	1 42.5	1 42.8	1 37.8	50	0.5	110	1.2	170	1.8
51	1 42.8	1 43.0	1 38.1	51	0.6	111	1.2	171	1.9
52	1 43.0	1 43.3	1 38.3	52	0.6	112	1.2	172	1.9
53	1 43.3	1 43.5	1 38.5	53	0.6	113	1.2	173	1.9
54	1 43.5	1 43.8	1 38.8	54	0.6	114	1.2	174	1.9
55	1 43.8	1 44.0	1 39.0	55	0.6	115	1.2	175	1.9
56	1 44.0	1 44.3	1 39.3	56	0.6	116	1.3	176	1.9
57	1 44.3	1 44.5	1 39.5	57	0.6	117	1.3	177	1.9
58	1 44.5	1 44.8	1 39.7	58	0.6	118	1.3	178	1.9
59	1 44.8	1 45.0	1 40.0	59	0.6	119	1.3	179	1.9
60	1 45.0	1 45.3	1 40.2	60	0.7	120	1.3	180	2.0

7m

Sec.	SUN PLANET	♈	MOON	code	corr'n	code	corr'n	code	corr'n
	° ′	° ′	° ′		′		′		′
0	1 45.0	1 45.3	1 40.2	0	0.0	60	0.8	120	1.5
1	1 45.3	1 45.5	1 40.5	1	0.0	61	0.8	121	1.5
2	1 45.5	1 45.8	1 40.7	2	0.0	62	0.8	122	1.5
3	1 45.8	1 46.0	1 40.9	3	0.0	63	0.8	123	1.5
4	1 46.0	1 46.3	1 41.2	4	0.1	64	0.8	124	1.6
5	1 46.3	1 46.5	1 41.4	5	0.1	65	0.8	125	1.6
6	1 46.5	1 46.8	1 41.6	6	0.1	66	0.8	126	1.6
7	1 46.8	1 47.0	1 41.9	7	0.1	67	0.8	127	1.6
8	1 47.0	1 47.3	1 42.1	8	0.1	68	0.9	128	1.6
9	1 47.3	1 47.5	1 42.4	9	0.1	69	0.9	129	1.6
10	1 47.5	1 47.8	1 42.6	10	0.1	70	0.9	130	1.6
11	1 47.8	1 48.0	1 42.8	11	0.1	71	0.9	131	1.6
12	1 48.0	1 48.3	1 43.1	12	0.2	72	0.9	132	1.7
13	1 48.3	1 48.5	1 43.3	13	0.2	73	0.9	133	1.7
14	1 48.5	1 48.8	1 43.6	14	0.2	74	0.9	134	1.7
15	1 48.8	1 49.0	1 43.8	15	0.2	75	0.9	135	1.7
16	1 49.0	1 49.3	1 44.0	16	0.2	76	1.0	136	1.7
17	1 49.3	1 49.5	1 44.3	17	0.2	77	1.0	137	1.7
18	1 49.5	1 49.8	1 44.5	18	0.2	78	1.0	138	1.7
19	1 49.8	1 50.1	1 44.8	19	0.2	79	1.0	139	1.7
20	1 50.0	1 50.3	1 45.0	20	0.3	80	1.0	140	1.8
21	1 50.3	1 50.6	1 45.2	21	0.3	81	1.0	141	1.8
22	1 50.5	1 50.8	1 45.5	22	0.3	82	1.0	142	1.8
23	1 50.8	1 51.1	1 45.7	23	0.3	83	1.0	143	1.8
24	1 51.0	1 51.3	1 45.9	24	0.3	84	1.1	144	1.8
25	1 51.3	1 51.6	1 46.2	25	0.3	85	1.1	145	1.8
26	1 51.5	1 51.8	1 46.4	26	0.3	86	1.1	146	1.8
27	1 51.8	1 52.1	1 46.7	27	0.3	87	1.1	147	1.8
28	1 52.0	1 52.3	1 46.9	28	0.4	88	1.1	148	1.9
29	1 52.3	1 52.6	1 47.1	29	0.4	89	1.1	149	1.9
30	1 52.5	1 52.8	1 47.4	30	0.4	90	1.1	150	1.9
31	1 52.8	1 53.1	1 47.6	31	0.4	91	1.1	151	1.9
32	1 53.0	1 53.3	1 47.9	32	0.4	92	1.2	152	1.9
33	1 53.3	1 53.6	1 48.1	33	0.4	93	1.2	153	1.9
34	1 53.5	1 53.8	1 48.3	34	0.4	94	1.2	154	1.9
35	1 53.8	1 54.1	1 48.6	35	0.4	95	1.2	155	1.9
36	1 54.0	1 54.3	1 48.8	36	0.5	96	1.2	156	2.0
37	1 54.3	1 54.6	1 49.0	37	0.5	97	1.2	157	2.0
38	1 54.5	1 54.8	1 49.3	38	0.5	98	1.2	158	2.0
39	1 54.8	1 55.1	1 49.5	39	0.5	99	1.2	159	2.0
40	1 55.0	1 55.3	1 49.8	40	0.5	100	1.3	160	2.0
41	1 55.3	1 55.6	1 50.0	41	0.5	101	1.3	161	2.0
42	1 55.5	1 55.8	1 50.2	42	0.5	102	1.3	162	2.0
43	1 55.8	1 56.1	1 50.5	43	0.5	103	1.3	163	2.0
44	1 56.0	1 56.3	1 50.7	44	0.6	104	1.3	164	2.1
45	1 56.3	1 56.6	1 51.0	45	0.6	105	1.3	165	2.1
46	1 56.5	1 56.8	1 51.2	46	0.6	106	1.3	166	2.1
47	1 56.8	1 57.1	1 51.4	47	0.6	107	1.3	167	2.1
48	1 57.0	1 57.3	1 51.7	48	0.6	108	1.4	168	2.1
49	1 57.3	1 57.6	1 51.9	49	0.6	109	1.4	169	2.1
50	1 57.5	1 57.8	1 52.1	50	0.6	110	1.4	170	2.1
51	1 57.8	1 58.1	1 52.4	51	0.6	111	1.4	171	2.1
52	1 58.0	1 58.3	1 52.6	52	0.7	112	1.4	172	2.2
53	1 58.3	1 58.6	1 52.9	53	0.7	113	1.4	173	2.2
54	1 58.5	1 58.8	1 53.1	54	0.7	114	1.4	174	2.2
55	1 58.8	1 59.1	1 53.3	55	0.7	115	1.4	175	2.2
56	1 59.0	1 59.3	1 53.6	56	0.7	116	1.5	176	2.2
57	1 59.3	1 59.6	1 53.8	57	0.7	117	1.5	177	2.2
58	1 59.5	1 59.8	1 54.1	58	0.7	118	1.5	178	2.2
59	1 59.8	2 00.1	1 54.3	59	0.7	119	1.5	179	2.2
60	2 00.0	2 00.3	1 54.5	60	0.8	120	1.5	180	2.3

8m

Sec.	SUN PLANET	♈	MOON	code	corr'n	code	corr'n	code	corr'n
	° ′	° ′	° ′		′		′		′
0	2 00.0	2 00.3	1 54.5	0	0.0	60	0.9	120	1.7
1	2 00.3	2 00.6	1 54.8	1	0.0	61	0.9	121	1.7
2	2 00.5	2 00.8	1 55.0	2	0.0	62	0.9	122	1.7
3	2 00.8	2 01.1	1 55.2	3	0.0	63	0.9	123	1.7
4	2 01.0	2 01.3	1 55.5	4	0.1	64	0.9	124	1.8
5	2 01.3	2 01.6	1 55.7	5	0.1	65	0.9	125	1.8
6	2 01.5	2 01.8	1 56.0	6	0.1	66	0.9	126	1.8
7	2 01.8	2 02.1	1 56.2	7	0.1	67	0.9	127	1.8
8	2 02.0	2 02.3	1 56.4	8	0.1	68	1.0	128	1.8
9	2 02.3	2 02.6	1 56.7	9	0.1	69	1.0	129	1.8
10	2 02.5	2 02.8	1 56.9	10	0.1	70	1.0	130	1.8
11	2 02.8	2 03.1	1 57.2	11	0.2	71	1.0	131	1.9
12	2 03.0	2 03.3	1 57.4	12	0.2	72	1.0	132	1.9
13	2 03.3	2 03.6	1 57.6	13	0.2	73	1.0	133	1.9
14	2 03.5	2 03.8	1 57.9	14	0.2	74	1.0	134	1.9
15	2 03.8	2 04.1	1 58.1	15	0.2	75	1.1	135	1.9
16	2 04.0	2 04.3	1 58.4	16	0.2	76	1.1	136	1.9
17	2 04.3	2 04.6	1 58.6	17	0.2	77	1.1	137	1.9
18	2 04.5	2 04.8	1 58.8	18	0.3	78	1.1	138	2.0
19	2 04.8	2 05.1	1 59.1	19	0.3	79	1.1	139	2.0
20	2 05.0	2 05.3	1 59.3	20	0.3	80	1.1	140	2.0
21	2 05.3	2 05.6	1 59.5	21	0.3	81	1.1	141	2.0
22	2 05.5	2 05.8	1 59.8	22	0.3	82	1.2	142	2.0
23	2 05.8	2 06.1	2 00.0	23	0.3	83	1.2	143	2.0
24	2 06.0	2 06.3	2 00.3	24	0.3	84	1.2	144	2.0
25	2 06.3	2 06.6	2 00.5	25	0.4	85	1.2	145	2.1
26	2 06.5	2 06.8	2 00.7	26	0.4	86	1.2	146	2.1
27	2 06.8	2 07.1	2 01.0	27	0.4	87	1.2	147	2.1
28	2 07.0	2 07.3	2 01.2	28	0.4	88	1.2	148	2.1
29	2 07.3	2 07.6	2 01.5	29	0.4	89	1.3	149	2.1
30	2 07.5	2 07.8	2 01.7	30	0.4	90	1.3	150	2.1
31	2 07.8	2 08.1	2 01.9	31	0.4	91	1.3	151	2.1
32	2 08.0	2 08.4	2 02.2	32	0.5	92	1.3	152	2.2
33	2 08.3	2 08.6	2 02.4	33	0.5	93	1.3	153	2.2
34	2 08.5	2 08.9	2 02.6	34	0.5	94	1.3	154	2.2
35	2 08.8	2 09.1	2 02.9	35	0.5	95	1.3	155	2.2
36	2 09.0	2 09.4	2 03.1	36	0.5	96	1.4	156	2.2
37	2 09.3	2 09.6	2 03.4	37	0.5	97	1.4	157	2.2
38	2 09.5	2 09.9	2 03.6	38	0.5	98	1.4	158	2.2
39	2 09.8	2 10.1	2 03.8	39	0.6	99	1.4	159	2.3
40	2 10.0	2 10.4	2 04.1	40	0.6	100	1.4	160	2.3
41	2 10.3	2 10.6	2 04.3	41	0.6	101	1.4	161	2.3
42	2 10.5	2 10.9	2 04.6	42	0.6	102	1.4	162	2.3
43	2 10.8	2 11.1	2 04.8	43	0.6	103	1.5	163	2.3
44	2 11.0	2 11.4	2 05.0	44	0.6	104	1.5	164	2.3
45	2 11.3	2 11.6	2 05.3	45	0.6	105	1.5	165	2.3
46	2 11.5	2 11.9	2 05.5	46	0.7	106	1.5	166	2.4
47	2 11.8	2 12.1	2 05.7	47	0.7	107	1.5	167	2.4
48	2 12.0	2 12.4	2 06.0	48	0.7	108	1.5	168	2.4
49	2 12.3	2 12.6	2 06.2	49	0.7	109	1.5	169	2.4
50	2 12.5	2 12.9	2 06.5	50	0.7	110	1.6	170	2.4
51	2 12.8	2 13.1	2 06.7	51	0.7	111	1.6	171	2.4
52	2 13.0	2 13.4	2 06.9	52	0.7	112	1.6	172	2.4
53	2 13.3	2 13.6	2 07.2	53	0.8	113	1.6	173	2.5
54	2 13.5	2 13.9	2 07.4	54	0.8	114	1.6	174	2.5
55	2 13.8	2 14.1	2 07.7	55	0.8	115	1.6	175	2.5
56	2 14.0	2 14.4	2 07.9	56	0.8	116	1.6	176	2.5
57	2 14.3	2 14.6	2 08.1	57	0.8	117	1.7	177	2.5
58	2 14.5	2 14.9	2 08.4	58	0.8	118	1.7	178	2.5
59	2 14.8	2 15.1	2 08.6	59	0.8	119	1.7	179	2.5
60	2 15.0	2 15.4	2 08.9	60	0.9	120	1.7	180	2.6

9m

Sec.	SUN PLANET	♈	MOON	code	corr'n	code	corr'n	code	corr'n
	° ′	° ′	° ′		′		′		′
0	2 15.0	2 15.4	2 08.9	0	0.0	60	1.0	120	1.9
1	2 15.3	2 15.6	2 09.1	1	0.0	61	1.0	121	1.9
2	2 15.5	2 15.9	2 09.3	2	0.0	62	1.0	122	1.9
3	2 15.8	2 16.1	2 09.6	3	0.0	63	1.0	123	1.9
4	2 16.0	2 16.4	2 09.8	4	0.1	64	1.0	124	2.0
5	2 16.3	2 16.6	2 10.0	5	0.1	65	1.0	125	2.0
6	2 16.5	2 16.9	2 10.3	6	0.1	66	1.0	126	2.0
7	2 16.8	2 17.1	2 10.5	7	0.1	67	1.1	127	2.0
8	2 17.0	2 17.4	2 10.8	8	0.1	68	1.1	128	2.0
9	2 17.3	2 17.6	2 11.0	9	0.1	69	1.1	129	2.0
10	2 17.5	2 17.9	2 11.2	10	0.2	70	1.1	130	2.1
11	2 17.8	2 18.1	2 11.5	11	0.2	71	1.1	131	2.1
12	2 18.0	2 18.4	2 11.7	12	0.2	72	1.1	132	2.1
13	2 18.3	2 18.6	2 12.0	13	0.2	73	1.2	133	2.1
14	2 18.5	2 18.9	2 12.2	14	0.2	74	1.2	134	2.1
15	2 18.8	2 19.1	2 12.4	15	0.2	75	1.2	135	2.1
16	2 19.0	2 19.4	2 12.7	16	0.3	76	1.2	136	2.2
17	2 19.3	2 19.6	2 12.9	17	0.3	77	1.2	137	2.2
18	2 19.5	2 19.9	2 13.1	18	0.3	78	1.2	138	2.2
19	2 19.8	2 20.1	2 13.4	19	0.3	79	1.3	139	2.2
20	2 20.0	2 20.4	2 13.6	20	0.3	80	1.3	140	2.2
21	2 20.3	2 20.6	2 13.9	21	0.3	81	1.3	141	2.2
22	2 20.5	2 20.9	2 14.1	22	0.3	82	1.3	142	2.2
23	2 20.8	2 21.1	2 14.3	23	0.4	83	1.3	143	2.3
24	2 21.0	2 21.4	2 14.6	24	0.4	84	1.3	144	2.3
25	2 21.3	2 21.6	2 14.8	25	0.4	85	1.3	145	2.3
26	2 21.5	2 21.9	2 15.1	26	0.4	86	1.4	146	2.3
27	2 21.8	2 22.1	2 15.3	27	0.4	87	1.4	147	2.3
28	2 22.0	2 22.4	2 15.5	28	0.4	88	1.4	148	2.3
29	2 22.3	2 22.6	2 15.8	29	0.5	89	1.4	149	2.4
30	2 22.5	2 22.9	2 16.0	30	0.5	90	1.4	150	2.4
31	2 22.8	2 23.1	2 16.2	31	0.5	91	1.4	151	2.4
32	2 23.0	2 23.4	2 16.5	32	0.5	92	1.5	152	2.4
33	2 23.3	2 23.6	2 16.7	33	0.5	93	1.5	153	2.4
34	2 23.5	2 23.9	2 17.0	34	0.5	94	1.5	154	2.4
35	2 23.8	2 24.1	2 17.2	35	0.6	95	1.5	155	2.5
36	2 24.0	2 24.4	2 17.4	36	0.6	96	1.5	156	2.5
37	2 24.3	2 24.6	2 17.7	37	0.6	97	1.5	157	2.5
38	2 24.5	2 24.9	2 17.9	38	0.6	98	1.6	158	2.5
39	2 24.8	2 25.1	2 18.2	39	0.6	99	1.6	159	2.5
40	2 25.0	2 25.4	2 18.4	40	0.6	100	1.6	160	2.5
41	2 25.3	2 25.6	2 18.6	41	0.6	101	1.6	161	2.5
42	2 25.5	2 25.9	2 18.9	42	0.7	102	1.6	162	2.6
43	2 25.8	2 26.1	2 19.1	43	0.7	103	1.6	163	2.6
44	2 26.0	2 26.4	2 19.3	44	0.7	104	1.6	164	2.6
45	2 26.3	2 26.7	2 19.6	45	0.7	105	1.7	165	2.6
46	2 26.5	2 26.9	2 19.8	46	0.7	106	1.7	166	2.6
47	2 26.8	2 27.2	2 20.1	47	0.7	107	1.7	167	2.6
48	2 27.0	2 27.4	2 20.3	48	0.8	108	1.7	168	2.7
49	2 27.3	2 27.7	2 20.5	49	0.8	109	1.7	169	2.7
50	2 27.5	2 27.9	2 20.8	50	0.8	110	1.7	170	2.7
51	2 27.8	2 28.2	2 21.0	51	0.8	111	1.8	171	2.7
52	2 28.0	2 28.4	2 21.3	52	0.8	112	1.8	172	2.7
53	2 28.3	2 28.7	2 21.5	53	0.8	113	1.8	173	2.7
54	2 28.5	2 28.9	2 21.7	54	0.9	114	1.8	174	2.8
55	2 28.8	2 29.2	2 22.0	55	0.9	115	1.8	175	2.8
56	2 29.0	2 29.4	2 22.2	56	0.9	116	1.8	176	2.8
57	2 29.3	2 29.7	2 22.5	57	0.9	117	1.9	177	2.8
58	2 29.5	2 29.9	2 22.7	58	0.9	118	1.9	178	2.8
59	2 29.8	2 30.2	2 22.9	59	0.9	119	1.9	179	2.8
60	2 30.0	2 30.4	2 23.2	60	1.0	120	1.9	180	2.9

10m

Sec.	SUN PLANET	♈	MOON	code	corr'n	code	corr'n	code	corr'n
	° ′	° ′	° ′		′		′		′
0	2 30.0	2 30.4	2 23.2	0	0.0	60	1.1	120	2.1
1	2 30.3	2 30.7	2 23.4	1	0.0	61	1.1	121	2.1
2	2 30.5	2 30.9	2 23.6	2	0.0	62	1.1	122	2.1
3	2 30.8	2 31.2	2 23.9	3	0.1	63	1.1	123	2.2
4	2 31.0	2 31.4	2 24.1	4	0.1	64	1.1	124	2.2
5	2 31.3	2 31.7	2 24.4	5	0.1	65	1.1	125	2.2
6	2 31.5	2 31.9	2 24.6	6	0.1	66	1.2	126	2.2
7	2 31.8	2 32.2	2 24.8	7	0.1	67	1.2	127	2.2
8	2 32.0	2 32.4	2 25.1	8	0.1	68	1.2	128	2.2
9	2 32.3	2 32.7	2 25.3	9	0.2	69	1.2	129	2.3
10	2 32.5	2 32.9	2 25.6	10	0.2	70	1.2	130	2.3
11	2 32.8	2 33.2	2 25.8	11	0.2	71	1.2	131	2.3
12	2 33.0	2 33.4	2 26.0	12	0.2	72	1.3	132	2.3
13	2 33.3	2 33.7	2 26.3	13	0.2	73	1.3	133	2.3
14	2 33.5	2 33.9	2 26.5	14	0.2	74	1.3	134	2.3
15	2 33.8	2 34.2	2 26.7	15	0.3	75	1.3	135	2.4
16	2 34.0	2 34.4	2 27.0	16	0.3	76	1.3	136	2.4
17	2 34.3	2 34.7	2 27.2	17	0.3	77	1.3	137	2.4
18	2 34.5	2 34.9	2 27.5	18	0.3	78	1.4	138	2.4
19	2 34.8	2 35.2	2 27.7	19	0.3	79	1.4	139	2.4
20	2 35.0	2 35.4	2 27.9	20	0.4	80	1.4	140	2.5
21	2 35.3	2 35.7	2 28.2	21	0.4	81	1.4	141	2.5
22	2 35.5	2 35.9	2 28.4	22	0.4	82	1.4	142	2.5
23	2 35.8	2 36.2	2 28.7	23	0.4	83	1.5	143	2.5
24	2 36.0	2 36.4	2 28.9	24	0.4	84	1.5	144	2.5
25	2 36.3	2 36.7	2 29.1	25	0.4	85	1.5	145	2.5
26	2 36.5	2 36.9	2 29.4	26	0.5	86	1.5	146	2.6
27	2 36.8	2 37.2	2 29.6	27	0.5	87	1.5	147	2.6
28	2 37.0	2 37.4	2 29.8	28	0.5	88	1.5	148	2.6
29	2 37.3	2 37.7	2 30.1	29	0.5	89	1.6	149	2.6
30	2 37.5	2 37.9	2 30.3	30	0.5	90	1.6	150	2.6
31	2 37.8	2 38.2	2 30.6	31	0.5	91	1.6	151	2.6
32	2 38.0	2 38.4	2 30.8	32	0.6	92	1.6	152	2.7
33	2 38.3	2 38.7	2 31.0	33	0.6	93	1.6	153	2.7
34	2 38.5	2 38.9	2 31.3	34	0.6	94	1.6	154	2.7
35	2 38.8	2 39.2	2 31.5	35	0.6	95	1.7	155	2.7
36	2 39.0	2 39.4	2 31.8	36	0.6	96	1.7	156	2.7
37	2 39.3	2 39.7	2 32.0	37	0.6	97	1.7	157	2.7
38	2 39.5	2 39.9	2 32.2	38	0.7	98	1.7	158	2.8
39	2 39.8	2 40.2	2 32.5	39	0.7	99	1.7	159	2.8
40	2 40.0	2 40.4	2 32.7	40	0.7	100	1.8	160	2.8
41	2 40.3	2 40.7	2 32.9	41	0.7	101	1.8	161	2.8
42	2 40.5	2 40.9	2 33.2	42	0.7	102	1.8	162	2.8
43	2 40.8	2 41.2	2 33.4	43	0.8	103	1.8	163	2.9
44	2 41.0	2 41.4	2 33.7	44	0.8	104	1.8	164	2.9
45	2 41.3	2 41.7	2 33.9	45	0.8	105	1.8	165	2.9
46	2 41.5	2 41.9	2 34.1	46	0.8	106	1.9	166	2.9
47	2 41.8	2 42.2	2 34.4	47	0.8	107	1.9	167	2.9
48	2 42.0	2 42.4	2 34.6	48	0.8	108	1.9	168	2.9
49	2 42.3	2 42.7	2 34.9	49	0.9	109	1.9	169	3.0
50	2 42.5	2 42.9	2 35.1	50	0.9	110	1.9	170	3.0
51	2 42.8	2 43.2	2 35.3	51	0.9	111	1.9	171	3.0
52	2 43.0	2 43.4	2 35.6	52	0.9	112	2.0	172	3.0
53	2 43.3	2 43.7	2 35.8	53	0.9	113	2.0	173	3.0
54	2 43.5	2 43.9	2 36.1	54	0.9	114	2.0	174	3.0
55	2 43.8	2 44.2	2 36.3	55	1.0	115	2.0	175	3.1
56	2 44.0	2 44.4	2 36.5	56	1.0	116	2.0	176	3.1
57	2 44.3	2 44.7	2 36.8	57	1.0	117	2.0	177	3.1
58	2 44.5	2 45.0	2 37.0	58	1.0	118	2.1	178	3.1
59	2 44.8	2 45.2	2 37.2	59	1.0	119	2.1	179	3.1
60	2 45.0	2 45.5	2 37.5	60	1.1	120	2.1	180	3.2

11m

Sec.	SUN PLANET	♈	MOON	code	corr'n	code	corr'n	code	corr'n
	° ′	° ′	° ′		′		′		′
0	2 45.0	2 45.5	2 37.5	0	0.0	60	1.2	120	2.3
1	2 45.3	2 45.7	2 37.7	1	0.0	61	1.2	121	2.3
2	2 45.5	2 46.0	2 38.0	2	0.0	62	1.2	122	2.3
3	2 45.8	2 46.2	2 38.2	3	0.1	63	1.2	123	2.4
4	2 46.0	2 46.5	2 38.4	4	0.1	64	1.2	124	2.4
5	2 46.3	2 46.7	2 38.7	5	0.1	65	1.2	125	2.4
6	2 46.5	2 47.0	2 38.9	6	0.1	66	1.3	126	2.4
7	2 46.8	2 47.2	2 39.2	7	0.1	67	1.3	127	2.4
8	2 47.0	2 47.5	2 39.4	8	0.2	68	1.3	128	2.5
9	2 47.3	2 47.7	2 39.6	9	0.2	69	1.3	129	2.5
10	2 47.5	2 48.0	2 39.9	10	0.2	70	1.3	130	2.5
11	2 47.8	2 48.2	2 40.1	11	0.2	71	1.4	131	2.5
12	2 48.0	2 48.5	2 40.3	12	0.2	72	1.4	132	2.5
13	2 48.3	2 48.7	2 40.6	13	0.2	73	1.4	133	2.5
14	2 48.5	2 49.0	2 40.8	14	0.3	74	1.4	134	2.6
15	2 48.8	2 49.2	2 41.1	15	0.3	75	1.4	135	2.6
16	2 49.0	2 49.5	2 41.3	16	0.3	76	1.5	136	2.6
17	2 49.3	2 49.7	2 41.5	17	0.3	77	1.5	137	2.6
18	2 49.5	2 50.0	2 41.8	18	0.3	78	1.5	138	2.6
19	2 49.8	2 50.2	2 42.0	19	0.4	79	1.5	139	2.7
20	2 50.0	2 50.5	2 42.3	20	0.4	80	1.5	140	2.7
21	2 50.3	2 50.7	2 42.5	21	0.4	81	1.6	141	2.7
22	2 50.5	2 51.0	2 42.7	22	0.4	82	1.6	142	2.7
23	2 50.8	2 51.2	2 43.0	23	0.4	83	1.6	143	2.7
24	2 51.0	2 51.5	2 43.2	24	0.5	84	1.6	144	2.8
25	2 51.3	2 51.7	2 43.4	25	0.5	85	1.6	145	2.8
26	2 51.5	2 52.0	2 43.7	26	0.5	86	1.6	146	2.8
27	2 51.8	2 52.2	2 43.9	27	0.5	87	1.7	147	2.8
28	2 52.0	2 52.5	2 44.2	28	0.5	88	1.7	148	2.8
29	2 52.3	2 52.7	2 44.4	29	0.6	89	1.7	149	2.9
30	2 52.5	2 53.0	2 44.6	30	0.6	90	1.7	150	2.9
31	2 52.8	2 53.2	2 44.9	31	0.6	91	1.7	151	2.9
32	2 53.0	2 53.5	2 45.1	32	0.6	92	1.8	152	2.9
33	2 53.3	2 53.7	2 45.4	33	0.6	93	1.8	153	2.9
34	2 53.5	2 54.0	2 45.6	34	0.7	94	1.8	154	3.0
35	2 53.8	2 54.2	2 45.8	35	0.7	95	1.8	155	3.0
36	2 54.0	2 54.5	2 46.1	36	0.7	96	1.8	156	3.0
37	2 54.3	2 54.7	2 46.3	37	0.7	97	1.9	157	3.0
38	2 54.5	2 55.0	2 46.6	38	0.7	98	1.9	158	3.0
39	2 54.8	2 55.2	2 46.8	39	0.7	99	1.9	159	3.0
40	2 55.0	2 55.5	2 47.0	40	0.8	100	1.9	160	3.1
41	2 55.3	2 55.7	2 47.3	41	0.8	101	1.9	161	3.1
42	2 55.5	2 56.0	2 47.5	42	0.8	102	2.0	162	3.1
43	2 55.8	2 56.2	2 47.7	43	0.8	103	2.0	163	3.1
44	2 56.0	2 56.5	2 48.0	44	0.8	104	2.0	164	3.1
45	2 56.3	2 56.7	2 48.2	45	0.9	105	2.0	165	3.2
46	2 56.5	2 57.0	2 48.5	46	0.9	106	2.0	166	3.2
47	2 56.8	2 57.2	2 48.7	47	0.9	107	2.1	167	3.2
48	2 57.0	2 57.5	2 48.9	48	0.9	108	2.1	168	3.2
49	2 57.3	2 57.7	2 49.2	49	0.9	109	2.1	169	3.2
50	2 57.5	2 58.0	2 49.4	50	1.0	110	2.1	170	3.3
51	2 57.8	2 58.2	2 49.7	51	1.0	111	2.1	171	3.3
52	2 58.0	2 58.5	2 49.9	52	1.0	112	2.1	172	3.3
53	2 58.3	2 58.7	2 50.1	53	1.0	113	2.2	173	3.3
54	2 58.5	2 59.0	2 50.4	54	1.0	114	2.2	174	3.3
55	2 58.8	2 59.2	2 50.6	55	1.1	115	2.2	175	3.4
56	2 59.0	2 59.5	2 50.8	56	1.1	116	2.2	176	3.4
57	2 59.3	2 59.7	2 51.1	57	1.1	117	2.2	177	3.4
58	2 59.5	3 00.0	2 51.3	58	1.1	118	2.3	178	3.4
59	2 59.8	3 00.2	2 51.6	59	1.1	119	2.3	179	3.4
60	3 00.0	3 00.5	2 51.8	60	1.2	120	2.3	180	3.5

12ᵐ

Sec.	SUN PLANET	♈	MOON	code	corr'n	code	corr'n	code	corr'n
	° ′	° ′	° ′		′		′		′
0	3 00.0	3 00.5	2 51.8	0	0.0	60	1.3	120	2.5
1	3 00.3	3 00.7	2 52.0	1	0.0	61	1.3	121	2.5
2	3 00.5	3 01.0	2 52.3	2	0.0	62	1.3	122	2.5
3	3 00.8	3 01.2	2 52.5	3	0.1	63	1.3	123	2.6
4	3 01.0	3 01.5	2 52.8	4	0.1	64	1.3	124	2.6
5	3 01.3	3 01.7	2 53.0	5	0.1	65	1.4	125	2.6
6	3 01.5	3 02.0	2 53.2	6	0.1	66	1.4	126	2.6
7	3 01.8	3 02.2	2 53.5	7	0.1	67	1.4	127	2.6
8	3 02.0	3 02.5	2 53.7	8	0.2	68	1.4	128	2.7
9	3 02.3	3 02.7	2 53.9	9	0.2	69	1.4	129	2.7
10	3 02.5	3 03.0	2 54.2	10	0.2	70	1.5	130	2.7
11	3 02.8	3 03.3	2 54.4	11	0.2	71	1.5	131	2.7
12	3 03.0	3 03.5	2 54.7	12	0.3	72	1.5	132	2.8
13	3 03.3	3 03.8	2 54.9	13	0.3	73	1.5	133	2.8
14	3 03.5	3 04.0	2 55.1	14	0.3	74	1.5	134	2.8
15	3 03.8	3 04.3	2 55.4	15	0.3	75	1.6	135	2.8
16	3 04.0	3 04.5	2 55.6	16	0.3	76	1.6	136	2.8
17	3 04.3	3 04.8	2 55.9	17	0.4	77	1.6	137	2.9
18	3 04.5	3 05.0	2 56.1	18	0.4	78	1.6	138	2.9
19	3 04.8	3 05.3	2 56.3	19	0.4	79	1.6	139	2.9
20	3 05.0	3 05.5	2 56.6	20	0.4	80	1.7	140	2.9
21	3 05.3	3 05.8	2 56.8	21	0.4	81	1.7	141	2.9
22	3 05.5	3 06.0	2 57.0	22	0.5	82	1.7	142	3.0
23	3 05.8	3 06.3	2 57.3	23	0.5	83	1.7	143	3.0
24	3 06.0	3 06.5	2 57.5	24	0.5	84	1.8	144	3.0
25	3 06.3	3 06.8	2 57.8	25	0.5	85	1.8	145	3.0
26	3 06.5	3 07.0	2 58.0	26	0.5	86	1.8	146	3.0
27	3 06.8	3 07.3	2 58.2	27	0.6	87	1.8	147	3.1
28	3 07.0	3 07.5	2 58.5	28	0.6	88	1.8	148	3.1
29	3 07.3	3 07.8	2 58.7	29	0.6	89	1.9	149	3.1
30	3 07.5	3 08.0	2 59.0	30	0.6	90	1.9	150	3.1
31	3 07.8	3 08.3	2 59.2	31	0.6	91	1.9	151	3.1
32	3 08.0	3 08.5	2 59.4	32	0.7	92	1.9	152	3.2
33	3 08.3	3 08.8	2 59.7	33	0.7	93	1.9	153	3.2
34	3 08.5	3 09.0	2 59.9	34	0.7	94	2.0	154	3.2
35	3 08.8	3 09.3	3 00.2	35	0.7	95	2.0	155	3.2
36	3 09.0	3 09.5	3 00.4	36	0.8	96	2.0	156	3.3
37	3 09.3	3 09.8	3 00.6	37	0.8	97	2.0	157	3.3
38	3 09.5	3 10.0	3 00.9	38	0.8	98	2.0	158	3.3
39	3 09.8	3 10.3	3 01.1	39	0.8	99	2.1	159	3.3
40	3 10.0	3 10.5	3 01.3	40	0.8	100	2.1	160	3.3
41	3 10.3	3 10.8	3 01.6	41	0.9	101	2.1	161	3.4
42	3 10.5	3 11.0	3 01.8	42	0.9	102	2.1	162	3.4
43	3 10.8	3 11.3	3 02.1	43	0.9	103	2.1	163	3.4
44	3 11.0	3 11.5	3 02.3	44	0.9	104	2.2	164	3.4
45	3 11.3	3 11.8	3 02.5	45	0.9	105	2.2	165	3.4
46	3 11.5	3 12.0	3 02.8	46	1.0	106	2.2	166	3.5
47	3 11.8	3 12.3	3 03.0	47	1.0	107	2.2	167	3.5
48	3 12.0	3 12.5	3 03.3	48	1.0	108	2.3	168	3.5
49	3 12.3	3 12.8	3 03.5	49	1.0	109	2.3	169	3.5
50	3 12.5	3 13.0	3 03.7	50	1.0	110	2.3	170	3.5
51	3 12.8	3 13.3	3 04.0	51	1.1	111	2.3	171	3.6
52	3 13.0	3 13.5	3 04.2	52	1.1	112	2.3	172	3.6
53	3 13.3	3 13.8	3 04.4	53	1.1	113	2.4	173	3.6
54	3 13.5	3 14.0	3 04.7	54	1.1	114	2.4	174	3.6
55	3 13.8	3 14.3	3 04.9	55	1.1	115	2.4	175	3.6
56	3 14.0	3 14.5	3 05.2	56	1.2	116	2.4	176	3.7
57	3 14.3	3 14.8	3 05.4	57	1.2	117	2.4	177	3.7
58	3 14.5	3 15.0	3 05.6	58	1.2	118	2.5	178	3.7
59	3 14.8	3 15.3	3 05.9	59	1.2	119	2.5	179	3.7
60	3 15.0	3 15.5	3 06.1	60	1.3	120	2.5	180	3.8

13ᵐ

Sec.	SUN PLANET	♈	MOON	code	corr'n	code	corr'n	code	corr'n
	° ′	° ′	° ′		′		′		′
0	3 15.0	3 15.5	3 06.1	0	0.0	60	1.4	120	2.7
1	3 15.3	3 15.8	3 06.4	1	0.0	61	1.4	121	2.7
2	3 15.5	3 16.0	3 06.6	2	0.0	62	1.4	122	2.7
3	3 15.8	3 16.3	3 06.8	3	0.1	63	1.4	123	2.8
4	3 16.0	3 16.5	3 07.1	4	0.1	64	1.4	124	2.8
5	3 16.3	3 16.8	3 07.3	5	0.1	65	1.5	125	2.8
6	3 16.5	3 17.0	3 07.5	6	0.1	66	1.5	126	2.8
7	3 16.8	3 17.3	3 07.8	7	0.2	67	1.5	127	2.9
8	3 17.0	3 17.5	3 08.0	8	0.2	68	1.5	128	2.9
9	3 17.3	3 17.8	3 08.3	9	0.2	69	1.6	129	2.9
10	3 17.5	3 18.0	3 08.5	10	0.2	70	1.6	130	2.9
11	3 17.8	3 18.3	3 08.7	11	0.2	71	1.6	131	2.9
12	3 18.0	3 18.5	3 09.0	12	0.3	72	1.6	132	3.0
13	3 18.3	3 18.8	3 09.2	13	0.3	73	1.6	133	3.0
14	3 18.5	3 19.0	3 09.5	14	0.3	74	1.7	134	3.0
15	3 18.8	3 19.3	3 09.7	15	0.3	75	1.7	135	3.0
16	3 19.0	3 19.5	3 09.9	16	0.4	76	1.7	136	3.1
17	3 19.3	3 19.8	3 10.2	17	0.4	77	1.7	137	3.1
18	3 19.5	3 20.0	3 10.4	18	0.4	78	1.8	138	3.1
19	3 19.8	3 20.3	3 10.7	19	0.4	79	1.8	139	3.1
20	3 20.0	3 20.5	3 10.9	20	0.5	80	1.8	140	3.2
21	3 20.3	3 20.8	3 11.1	21	0.5	81	1.8	141	3.2
22	3 20.5	3 21.0	3 11.4	22	0.5	82	1.8	142	3.2
23	3 20.8	3 21.3	3 11.6	23	0.5	83	1.9	143	3.2
24	3 21.0	3 21.6	3 11.8	24	0.5	84	1.9	144	3.2
25	3 21.3	3 21.8	3 12.1	25	0.6	85	1.9	145	3.3
26	3 21.5	3 22.1	3 12.3	26	0.6	86	1.9	146	3.3
27	3 21.8	3 22.3	3 12.6	27	0.6	87	2.0	147	3.3
28	3 22.0	3 22.6	3 12.8	28	0.6	88	2.0	148	3.3
29	3 22.3	3 22.8	3 13.0	29	0.7	89	2.0	149	3.4
30	3 22.5	3 23.1	3 13.3	30	0.7	90	2.0	150	3.4
31	3 22.8	3 23.3	3 13.5	31	0.7	91	2.0	151	3.4
32	3 23.0	3 23.6	3 13.8	32	0.7	92	2.1	152	3.4
33	3 23.3	3 23.8	3 14.0	33	0.7	93	2.1	153	3.4
34	3 23.5	3 24.1	3 14.2	34	0.8	94	2.1	154	3.5
35	3 23.8	3 24.3	3 14.5	35	0.8	95	2.1	155	3.5
36	3 24.0	3 24.6	3 14.7	36	0.8	96	2.2	156	3.5
37	3 24.3	3 24.8	3 14.9	37	0.8	97	2.2	157	3.5
38	3 24.5	3 25.1	3 15.2	38	0.9	98	2.2	158	3.6
39	3 24.8	3 25.3	3 15.4	39	0.9	99	2.2	159	3.6
40	3 25.0	3 25.6	3 15.7	40	0.9	100	2.3	160	3.6
41	3 25.3	3 25.8	3 15.9	41	0.9	101	2.3	161	3.6
42	3 25.5	3 26.1	3 16.1	42	0.9	102	2.3	162	3.6
43	3 25.8	3 26.3	3 16.4	43	1.0	103	2.3	163	3.7
44	3 26.0	3 26.6	3 16.6	44	1.0	104	2.3	164	3.7
45	3 26.3	3 26.8	3 16.9	45	1.0	105	2.4	165	3.7
46	3 26.5	3 27.1	3 17.1	46	1.0	106	2.4	166	3.7
47	3 26.8	3 27.3	3 17.3	47	1.1	107	2.4	167	3.8
48	3 27.0	3 27.6	3 17.6	48	1.1	108	2.4	168	3.8
49	3 27.3	3 27.8	3 17.8	49	1.1	109	2.5	169	3.8
50	3 27.5	3 28.1	3 18.0	50	1.1	110	2.5	170	3.8
51	3 27.8	3 28.3	3 18.3	51	1.1	111	2.5	171	3.8
52	3 28.0	3 28.6	3 18.5	52	1.2	112	2.5	172	3.9
53	3 28.3	3 28.8	3 18.8	53	1.2	113	2.5	173	3.9
54	3 28.5	3 29.1	3 19.0	54	1.2	114	2.6	174	3.9
55	3 28.8	3 29.3	3 19.2	55	1.2	115	2.6	175	3.9
56	3 29.0	3 29.6	3 19.5	56	1.3	116	2.6	176	4.0
57	3 29.3	3 29.8	3 19.7	57	1.3	117	2.6	177	4.0
58	3 29.5	3 30.1	3 20.0	58	1.3	118	2.7	178	4.0
59	3 29.8	3 30.3	3 20.2	59	1.3	119	2.7	179	4.0
60	3 30.0	3 30.6	3 20.4	60	1.4	120	2.7	180	4.1

14m

Sec.	SUN PLANET	♈	MOON	code	corr'n	code	corr'n	code	corr'n
	° ′	° ′	° ′		′		′		′
0	3 30.0	3 30.6	3 20.4	0	0.0	60	1.5	120	2.9
1	3 30.3	3 30.8	3 20.7	1	0.0	61	1.5	121	2.9
2	3 30.5	3 31.1	3 20.9	2	0.0	62	1.5	122	2.9
3	3 30.8	3 31.3	3 21.1	3	0.1	63	1.5	123	3.0
4	3 31.0	3 31.6	3 21.4	4	0.1	64	1.5	124	3.0
5	3 31.3	3 31.8	3 21.6	5	0.1	65	1.6	125	3.0
6	3 31.5	3 32.1	3 21.9	6	0.1	66	1.6	126	3.0
7	3 31.8	3 32.3	3 22.1	7	0.2	67	1.6	127	3.1
8	3 32.0	3 32.6	3 22.3	8	0.2	68	1.6	128	3.1
9	3 32.3	3 32.8	3 22.6	9	0.2	69	1.7	129	3.1
10	3 32.5	3 33.1	3 22.8	10	0.2	70	1.7	130	3.1
11	3 32.8	3 33.3	3 23.1	11	0.3	71	1.7	131	3.2
12	3 33.0	3 33.6	3 23.3	12	0.3	72	1.7	132	3.2
13	3 33.3	3 33.8	3 23.5	13	0.3	73	1.8	133	3.2
14	3 33.5	3 34.1	3 23.8	14	0.3	74	1.8	134	3.2
15	3 33.8	3 34.3	3 24.0	15	0.4	75	1.8	135	3.3
16	3 34.0	3 34.6	3 24.3	16	0.4	76	1.8	136	3.3
17	3 34.3	3 34.8	3 24.5	17	0.4	77	1.9	137	3.3
18	3 34.5	3 35.1	3 24.7	18	0.4	78	1.9	138	3.3
19	3 34.8	3 35.3	3 25.0	19	0.5	79	1.9	139	3.4
20	3 35.0	3 35.6	3 25.2	20	0.5	80	1.9	140	3.4
21	3 35.3	3 35.8	3 25.4	21	0.5	81	2.0	141	3.4
22	3 35.5	3 36.1	3 25.7	22	0.5	82	2.0	142	3.4
23	3 35.8	3 36.3	3 25.9	23	0.6	83	2.0	143	3.5
24	3 36.0	3 36.6	3 26.2	24	0.6	84	2.0	144	3.5
25	3 36.3	3 36.8	3 26.4	25	0.6	85	2.1	145	3.5
26	3 36.5	3 37.1	3 26.6	26	0.6	86	2.1	146	3.5
27	3 36.8	3 37.3	3 26.9	27	0.7	87	2.1	147	3.6
28	3 37.0	3 37.6	3 27.1	28	0.7	88	2.1	148	3.6
29	3 37.3	3 37.8	3 27.4	29	0.7	89	2.2	149	3.6
30	3 37.5	3 38.1	3 27.6	30	0.7	90	2.2	150	3.6
31	3 37.8	3 38.3	3 27.8	31	0.7	91	2.2	151	3.6
32	3 38.0	3 38.6	3 28.1	32	0.8	92	2.2	152	3.7
33	3 38.3	3 38.8	3 28.3	33	0.8	93	2.2	153	3.7
34	3 38.5	3 39.1	3 28.5	34	0.8	94	2.3	154	3.7
35	3 38.8	3 39.3	3 28.8	35	0.8	95	2.3	155	3.7
36	3 39.0	3 39.6	3 29.0	36	0.9	96	2.3	156	3.8
37	3 39.3	3 39.9	3 29.3	37	0.9	97	2.3	157	3.8
38	3 39.5	3 40.1	3 29.5	38	0.9	98	2.4	158	3.8
39	3 39.8	3 40.4	3 29.7	39	0.9	99	2.4	159	3.8
40	3 40.0	3 40.6	3 30.0	40	1.0	100	2.4	160	3.9
41	3 40.3	3 40.9	3 30.2	41	1.0	101	2.4	161	3.9
42	3 40.5	3 41.1	3 30.5	42	1.0	102	2.5	162	3.9
43	3 40.8	3 41.4	3 30.7	43	1.0	103	2.5	163	3.9
44	3 41.0	3 41.6	3 30.9	44	1.1	104	2.5	164	4.0
45	3 41.3	3 41.9	3 31.2	45	1.1	105	2.5	165	4.0
46	3 41.5	3 42.1	3 31.4	46	1.1	106	2.6	166	4.0
47	3 41.8	3 42.4	3 31.6	47	1.1	107	2.6	167	4.0
48	3 42.0	3 42.6	3 31.9	48	1.2	108	2.6	168	4.1
49	3 42.3	3 42.9	3 32.1	49	1.2	109	2.6	169	4.1
50	3 42.5	3 43.1	3 32.4	50	1.2	110	2.7	170	4.1
51	3 42.8	3 43.4	3 32.6	51	1.2	111	2.7	171	4.1
52	3 43.0	3 43.6	3 32.8	52	1.3	112	2.7	172	4.2
53	3 43.3	3 43.9	3 33.1	53	1.3	113	2.7	173	4.2
54	3 43.5	3 44.1	3 33.3	54	1.3	114	2.8	174	4.2
55	3 43.8	3 44.4	3 33.6	55	1.3	115	2.8	175	4.2
56	3 44.0	3 44.6	3 33.8	56	1.4	116	2.8	176	4.3
57	3 44.3	3 44.9	3 34.0	57	1.4	117	2.8	177	4.3
58	3 44.5	3 45.1	3 34.3	58	1.4	118	2.9	178	4.3
59	3 44.8	3 45.4	3 34.5	59	1.4	119	2.9	179	4.3
60	3 45.0	3 45.6	3 34.8	60	1.5	120	2.9	180	4.4

15m

Sec.	SUN PLANET	♈	MOON	code	corr'n	code	corr'n	code	corr'n
	° ′	° ′	° ′		′		′		′
0	3 45.0	3 45.6	3 34.8	0	0.0	60	1.6	120	3.1
1	3 45.3	3 45.9	3 35.0	1	0.0	61	1.6	121	3.1
2	3 45.5	3 46.1	3 35.2	2	0.1	62	1.6	122	3.2
3	3 45.8	3 46.4	3 35.5	3	0.1	63	1.6	123	3.2
4	3 46.0	3 46.6	3 35.7	4	0.1	64	1.7	124	3.2
5	3 46.3	3 46.9	3 35.9	5	0.1	65	1.7	125	3.2
6	3 46.5	3 47.1	3 36.2	6	0.2	66	1.7	126	3.3
7	3 46.8	3 47.4	3 36.4	7	0.2	67	1.7	127	3.3
8	3 47.0	3 47.6	3 36.7	8	0.2	68	1.8	128	3.3
9	3 47.3	3 47.9	3 36.9	9	0.2	69	1.8	129	3.3
10	3 47.5	3 48.1	3 37.1	10	0.3	70	1.8	130	3.4
11	3 47.8	3 48.4	3 37.4	11	0.3	71	1.8	131	3.4
12	3 48.0	3 48.6	3 37.6	12	0.3	72	1.9	132	3.4
13	3 48.3	3 48.9	3 37.9	13	0.3	73	1.9	133	3.4
14	3 48.5	3 49.1	3 38.1	14	0.4	74	1.9	134	3.5
15	3 48.8	3 49.4	3 38.3	15	0.4	75	1.9	135	3.5
16	3 49.0	3 49.6	3 38.6	16	0.4	76	2.0	136	3.5
17	3 49.3	3 49.9	3 38.8	17	0.4	77	2.0	137	3.5
18	3 49.5	3 50.1	3 39.0	18	0.5	78	2.0	138	3.6
19	3 49.8	3 50.4	3 39.3	19	0.5	79	2.0	139	3.6
20	3 50.0	3 50.6	3 39.5	20	0.5	80	2.1	140	3.6
21	3 50.3	3 50.9	3 39.8	21	0.5	81	2.1	141	3.6
22	3 50.5	3 51.1	3 40.0	22	0.6	82	2.1	142	3.7
23	3 50.8	3 51.4	3 40.2	23	0.6	83	2.1	143	3.7
24	3 51.0	3 51.6	3 40.5	24	0.6	84	2.2	144	3.7
25	3 51.3	3 51.9	3 40.7	25	0.6	85	2.2	145	3.7
26	3 51.5	3 52.1	3 41.0	26	0.7	86	2.2	146	3.8
27	3 51.8	3 52.4	3 41.2	27	0.7	87	2.2	147	3.8
28	3 52.0	3 52.6	3 41.4	28	0.7	88	2.3	148	3.8
29	3 52.3	3 52.9	3 41.7	29	0.7	89	2.3	149	3.8
30	3 52.5	3 53.1	3 41.9	30	0.8	90	2.3	150	3.9
31	3 52.8	3 53.4	3 42.1	31	0.8	91	2.4	151	3.9
32	3 53.0	3 53.6	3 42.4	32	0.8	92	2.4	152	3.9
33	3 53.3	3 53.9	3 42.6	33	0.9	93	2.4	153	4.0
34	3 53.5	3 54.1	3 42.9	34	0.9	94	2.4	154	4.0
35	3 53.8	3 54.4	3 43.1	35	0.9	95	2.5	155	4.0
36	3 54.0	3 54.6	3 43.3	36	0.9	96	2.5	156	4.0
37	3 54.3	3 54.9	3 43.6	37	1.0	97	2.5	157	4.1
38	3 54.5	3 55.1	3 43.8	38	1.0	98	2.5	158	4.1
39	3 54.8	3 55.4	3 44.1	39	1.0	99	2.6	159	4.1
40	3 55.0	3 55.6	3 44.3	40	1.0	100	2.6	160	4.1
41	3 55.3	3 55.9	3 44.5	41	1.1	101	2.6	161	4.2
42	3 55.5	3 56.1	3 44.8	42	1.1	102	2.6	162	4.2
43	3 55.8	3 56.4	3 45.0	43	1.1	103	2.7	163	4.2
44	3 56.0	3 56.6	3 45.2	44	1.1	104	2.7	164	4.2
45	3 56.3	3 56.9	3 45.5	45	1.2	105	2.7	165	4.3
46	3 56.5	3 57.1	3 45.7	46	1.2	106	2.7	166	4.3
47	3 56.8	3 57.4	3 46.0	47	1.2	107	2.8	167	4.3
48	3 57.0	3 57.6	3 46.2	48	1.2	108	2.8	168	4.3
49	3 57.3	3 57.9	3 46.4	49	1.3	109	2.8	169	4.4
50	3 57.5	3 58.2	3 46.7	50	1.3	110	2.8	170	4.4
51	3 57.8	3 58.4	3 46.9	51	1.3	111	2.9	171	4.4
52	3 58.0	3 58.7	3 47.2	52	1.3	112	2.9	172	4.4
53	3 58.3	3 58.9	3 47.4	53	1.4	113	2.9	173	4.5
54	3 58.5	3 59.2	3 47.6	54	1.4	114	2.9	174	4.5
55	3 58.8	3 59.4	3 47.9	55	1.4	115	3.0	175	4.5
56	3 59.0	3 59.7	3 48.1	56	1.4	116	3.0	176	4.5
57	3 59.3	3 59.9	3 48.4	57	1.5	117	3.0	177	4.6
58	3 59.5	4 00.2	3 48.6	58	1.5	118	3.0	178	4.6
59	3 59.8	4 00.4	3 48.8	59	1.5	119	3.1	179	4.6
60	4 00.0	4 00.7	3 49.1	60	1.6	120	3.1	180	4.7

16m

Sec.	SUN PLANET	♈	MOON	code	corr'n	code	corr'n	code	corr'n
	° ′	° ′	° ′		′		′		′
0	4 00.0	4 00.7	3 49.1	0	0.0	60	1.7	120	3.3
1	4 00.3	4 00.9	3 49.3	1	0.0	61	1.7	121	3.3
2	4 00.5	4 01.2	3 49.5	2	0.1	62	1.7	122	3.4
3	4 00.8	4 01.4	3 49.8	3	0.1	63	1.7	123	3.4
4	4 01.0	4 01.7	3 50.0	4	0.1	64	1.8	124	3.4
5	4 01.3	4 01.9	3 50.3	5	0.1	65	1.8	125	3.4
6	4 01.5	4 02.2	3 50.5	6	0.2	66	1.8	126	3.5
7	4 01.8	4 02.4	3 50.7	7	0.2	67	1.8	127	3.5
8	4 02.0	4 02.7	3 51.0	8	0.2	68	1.9	128	3.5
9	4 02.3	4 02.9	3 51.2	9	0.2	69	1.9	129	3.5
10	4 02.5	4 03.2	3 51.5	10	0.3	70	1.9	130	3.6
11	4 02.8	4 03.4	3 51.7	11	0.3	71	2.0	131	3.6
12	4 03.0	4 03.7	3 51.9	12	0.3	72	2.0	132	3.6
13	4 03.3	4 03.9	3 52.2	13	0.4	73	2.0	133	3.7
14	4 03.5	4 04.2	3 52.4	14	0.4	74	2.0	134	3.7
15	4 03.8	4 04.4	3 52.6	15	0.4	75	2.1	135	3.7
16	4 04.0	4 04.7	3 52.9	16	0.4	76	2.1	136	3.7
17	4 04.3	4 04.9	3 53.1	17	0.5	77	2.1	137	3.8
18	4 04.5	4 05.2	3 53.4	18	0.5	78	2.1	138	3.8
19	4 04.8	4 05.4	3 53.6	19	0.5	79	2.2	139	3.8
20	4 05.0	4 05.7	3 53.8	20	0.6	80	2.2	140	3.9
21	4 05.3	4 05.9	3 54.1	21	0.6	81	2.2	141	3.9
22	4 05.5	4 06.2	3 54.3	22	0.6	82	2.3	142	3.9
23	4 05.8	4 06.4	3 54.6	23	0.6	83	2.3	143	3.9
24	4 06.0	4 06.7	3 54.8	24	0.7	84	2.3	144	4.0
25	4 06.3	4 06.9	3 55.0	25	0.7	85	2.3	145	4.0
26	4 06.5	4 07.2	3 55.3	26	0.7	86	2.4	146	4.0
27	4 06.8	4 07.4	3 55.5	27	0.7	87	2.4	147	4.0
28	4 07.0	4 07.7	3 55.7	28	0.8	88	2.4	148	4.1
29	4 07.3	4 07.9	3 56.0	29	0.8	89	2.4	149	4.1
30	4 07.5	4 08.2	3 56.2	30	0.8	90	2.5	150	4.1
31	4 07.8	4 08.4	3 56.5	31	0.9	91	2.5	151	4.2
32	4 08.0	4 08.7	3 56.7	32	0.9	92	2.5	152	4.2
33	4 08.3	4 08.9	3 56.9	33	0.9	93	2.6	153	4.2
34	4 08.5	4 09.2	3 57.2	34	0.9	94	2.6	154	4.2
35	4 08.8	4 09.4	3 57.4	35	1.0	95	2.6	155	4.3
36	4 09.0	4 09.7	3 57.7	36	1.0	96	2.6	156	4.3
37	4 09.3	4 09.9	3 57.9	37	1.0	97	2.7	157	4.3
38	4 09.5	4 10.2	3 58.1	38	1.0	98	2.7	158	4.3
39	4 09.8	4 10.4	3 58.4	39	1.1	99	2.7	159	4.4
40	4 10.0	4 10.7	3 58.6	40	1.1	100	2.8	160	4.4
41	4 10.3	4 10.9	3 58.8	41	1.1	101	2.8	161	4.4
42	4 10.5	4 11.2	3 59.1	42	1.2	102	2.8	162	4.5
43	4 10.8	4 11.4	3 59.3	43	1.2	103	2.8	163	4.5
44	4 11.0	4 11.7	3 59.6	44	1.2	104	2.9	164	4.5
45	4 11.3	4 11.9	3 59.8	45	1.2	105	2.9	165	4.5
46	4 11.5	4 12.2	4 00.0	46	1.3	106	2.9	166	4.6
47	4 11.8	4 12.4	4 00.3	47	1.3	107	2.9	167	4.6
48	4 12.0	4 12.7	4 00.5	48	1.3	108	3.0	168	4.6
49	4 12.3	4 12.9	4 00.8	49	1.3	109	3.0	169	4.6
50	4 12.5	4 13.2	4 01.0	50	1.4	110	3.0	170	4.7
51	4 12.8	4 13.4	4 01.2	51	1.4	111	3.1	171	4.7
52	4 13.0	4 13.7	4 01.5	52	1.4	112	3.1	172	4.7
53	4 13.3	4 13.9	4 01.7	53	1.5	113	3.1	173	4.8
54	4 13.5	4 14.2	4 02.0	54	1.5	114	3.1	174	4.8
55	4 13.8	4 14.4	4 02.2	55	1.5	115	3.2	175	4.8
56	4 14.0	4 14.7	4 02.4	56	1.5	116	3.2	176	4.8
57	4 14.3	4 14.9	4 02.7	57	1.6	117	3.2	177	4.9
58	4 14.5	4 15.2	4 02.9	58	1.6	118	3.2	178	4.9
59	4 14.8	4 15.4	4 03.1	59	1.6	119	3.3	179	4.9
60	4 15.0	4 15.7	4 03.4	60	1.7	120	3.3	180	5.0

17m

Sec.	SUN PLANET	♈	MOON	code	corr'n	code	corr'n	code	corr'n
	° ′	° ′	° ′		′		′		′
0	4 15.0	4 15.7	4 03.4	0	0.0	60	1.8	120	3.5
1	4 15.3	4 15.9	4 03.6	1	0.0	61	1.8	121	3.5
2	4 15.5	4 16.2	4 03.9	2	0.1	62	1.8	122	3.6
3	4 15.8	4 16.5	4 04.1	3	0.1	63	1.8	123	3.6
4	4 16.0	4 16.7	4 04.3	4	0.1	64	1.9	124	3.6
5	4 16.3	4 17.0	4 04.6	5	0.1	65	1.9	125	3.6
6	4 16.5	4 17.2	4 04.8	6	0.2	66	1.9	126	3.7
7	4 16.8	4 17.5	4 05.1	7	0.2	67	2.0	127	3.7
8	4 17.0	4 17.7	4 05.3	8	0.2	68	2.0	128	3.7
9	4 17.3	4 18.0	4 05.5	9	0.3	69	2.0	129	3.8
10	4 17.5	4 18.2	4 05.8	10	0.3	70	2.0	130	3.8
11	4 17.8	4 18.5	4 06.0	11	0.3	71	2.1	131	3.8
12	4 18.0	4 18.7	4 06.2	12	0.4	72	2.1	132	3.9
13	4 18.3	4 19.0	4 06.5	13	0.4	73	2.1	133	3.9
14	4 18.5	4 19.2	4 06.7	14	0.4	74	2.2	134	3.9
15	4 18.8	4 19.5	4 07.0	15	0.4	75	2.2	135	3.9
16	4 19.0	4 19.7	4 07.2	16	0.5	76	2.2	136	4.0
17	4 19.3	4 20.0	4 07.4	17	0.5	77	2.2	137	4.0
18	4 19.5	4 20.2	4 07.7	18	0.5	78	2.3	138	4.0
19	4 19.8	4 20.5	4 07.9	19	0.6	79	2.3	139	4.1
20	4 20.0	4 20.7	4 08.2	20	0.6	80	2.3	140	4.1
21	4 20.3	4 21.0	4 08.4	21	0.6	81	2.4	141	4.1
22	4 20.5	4 21.2	4 08.6	22	0.6	82	2.4	142	4.1
23	4 20.8	4 21.5	4 08.9	23	0.7	83	2.4	143	4.2
24	4 21.0	4 21.7	4 09.1	24	0.7	84	2.5	144	4.2
25	4 21.3	4 22.0	4 09.3	25	0.7	85	2.5	145	4.2
26	4 21.5	4 22.2	4 09.6	26	0.8	86	2.5	146	4.3
27	4 21.8	4 22.5	4 09.8	27	0.8	87	2.5	147	4.3
28	4 22.0	4 22.7	4 10.1	28	0.8	88	2.6	148	4.3
29	4 22.3	4 23.0	4 10.3	29	0.8	89	2.6	149	4.3
30	4 22.5	4 23.2	4 10.5	30	0.9	90	2.6	150	4.4
31	4 22.8	4 23.5	4 10.8	31	0.9	91	2.7	151	4.4
32	4 23.0	4 23.7	4 11.0	32	0.9	92	2.7	152	4.4
33	4 23.3	4 24.0	4 11.3	33	1.0	93	2.7	153	4.5
34	4 23.5	4 24.2	4 11.5	34	1.0	94	2.7	154	4.5
35	4 23.8	4 24.5	4 11.7	35	1.0	95	2.8	155	4.5
36	4 24.0	4 24.7	4 12.0	36	1.1	96	2.8	156	4.6
37	4 24.3	4 25.0	4 12.2	37	1.1	97	2.8	157	4.6
38	4 24.5	4 25.2	4 12.5	38	1.1	98	2.9	158	4.6
39	4 24.8	4 25.5	4 12.7	39	1.1	99	2.9	159	4.6
40	4 25.0	4 25.7	4 12.9	40	1.2	100	2.9	160	4.7
41	4 25.3	4 26.0	4 13.2	41	1.2	101	2.9	161	4.7
42	4 25.5	4 26.2	4 13.4	42	1.2	102	3.0	162	4.7
43	4 25.8	4 26.5	4 13.6	43	1.3	103	3.0	163	4.8
44	4 26.0	4 26.7	4 13.9	44	1.3	104	3.0	164	4.8
45	4 26.3	4 27.0	4 14.1	45	1.3	105	3.1	165	4.8
46	4 26.5	4 27.2	4 14.4	46	1.3	106	3.1	166	4.8
47	4 26.8	4 27.5	4 14.6	47	1.4	107	3.1	167	4.9
48	4 27.0	4 27.7	4 14.8	48	1.4	108	3.2	168	4.9
49	4 27.3	4 28.0	4 15.1	49	1.4	109	3.2	169	4.9
50	4 27.5	4 28.2	4 15.3	50	1.5	110	3.2	170	5.0
51	4 27.8	4 28.5	4 15.6	51	1.5	111	3.2	171	5.0
52	4 28.0	4 28.7	4 15.8	52	1.5	112	3.3	172	5.0
53	4 28.3	4 29.0	4 16.0	53	1.5	113	3.3	173	5.0
54	4 28.5	4 29.2	4 16.3	54	1.6	114	3.3	174	5.1
55	4 28.8	4 29.5	4 16.5	55	1.6	115	3.4	175	5.1
56	4 29.0	4 29.7	4 16.7	56	1.6	116	3.4	176	5.1
57	4 29.3	4 30.0	4 17.0	57	1.7	117	3.4	177	5.2
58	4 29.5	4 30.2	4 17.2	58	1.7	118	3.4	178	5.2
59	4 29.8	4 30.5	4 17.5	59	1.7	119	3.5	179	5.2
60	4 30.0	4 30.7	4 17.7	60	1.8	120	3.5	180	5.3

18m

Sec.	SUN PLANET	♈	MOON	code	corr'n	code	corr'n	code	corr'n
	° ′	° ′	° ′		′		′		′
0	4 30.0	4 30.7	4 17.7	0	0.0	60	1.9	120	3.7
1	4 30.3	4 31.0	4 17.9	1	0.0	61	1.9	121	3.7
2	4 30.5	4 31.2	4 18.2	2	0.1	62	1.9	122	3.8
3	4 30.8	4 31.5	4 18.4	3	0.1	63	1.9	123	3.8
4	4 31.0	4 31.7	4 18.7	4	0.1	64	2.0	124	3.8
5	4 31.3	4 32.0	4 18.9	5	0.2	65	2.0	125	3.9
6	4 31.5	4 32.2	4 19.1	6	0.2	66	2.0	126	3.9
7	4 31.8	4 32.5	4 19.4	7	0.2	67	2.1	127	3.9
8	4 32.0	4 32.7	4 19.6	8	0.2	68	2.1	128	3.9
9	4 32.3	4 33.0	4 19.8	9	0.3	69	2.1	129	4.0
10	4 32.5	4 33.2	4 20.1	10	0.3	70	2.2	130	4.0
11	4 32.8	4 33.5	4 20.3	11	0.3	71	2.2	131	4.0
12	4 33.0	4 33.7	4 20.6	12	0.4	72	2.2	132	4.1
13	4 33.3	4 34.0	4 20.8	13	0.4	73	2.3	133	4.1
14	4 33.5	4 34.2	4 21.0	14	0.4	74	2.3	134	4.1
15	4 33.8	4 34.5	4 21.3	15	0.5	75	2.3	135	4.2
16	4 34.0	4 34.8	4 21.5	16	0.5	76	2.3	136	4.2
17	4 34.3	4 35.0	4 21.8	17	0.5	77	2.4	137	4.2
18	4 34.5	4 35.3	4 22.0	18	0.6	78	2.4	138	4.3
19	4 34.8	4 35.5	4 22.2	19	0.6	79	2.4	139	4.3
20	4 35.0	4 35.8	4 22.5	20	0.6	80	2.5	140	4.3
21	4 35.3	4 36.0	4 22.7	21	0.6	81	2.5	141	4.3
22	4 35.5	4 36.3	4 22.9	22	0.7	82	2.5	142	4.4
23	4 35.8	4 36.5	4 23.2	23	0.7	83	2.6	143	4.4
24	4 36.0	4 36.8	4 23.4	24	0.7	84	2.6	144	4.4
25	4 36.3	4 37.0	4 23.7	25	0.8	85	2.6	145	4.5
26	4 36.5	4 37.3	4 23.9	26	0.8	86	2.7	146	4.5
27	4 36.8	4 37.5	4 24.1	27	0.8	87	2.7	147	4.5
28	4 37.0	4 37.8	4 24.4	28	0.9	88	2.7	148	4.6
29	4 37.3	4 38.0	4 24.6	29	0.9	89	2.7	149	4.6
30	4 37.5	4 38.3	4 24.9	30	0.9	90	2.8	150	4.6
31	4 37.8	4 38.5	4 25.1	31	1.0	91	2.8	151	4.7
32	4 38.0	4 38.8	4 25.3	32	1.0	92	2.8	152	4.7
33	4 38.3	4 39.0	4 25.6	33	1.0	93	2.9	153	4.7
34	4 38.5	4 39.3	4 25.8	34	1.0	94	2.9	154	4.7
35	4 38.8	4 39.5	4 26.1	35	1.1	95	2.9	155	4.8
36	4 39.0	4 39.8	4 26.3	36	1.1	96	3.0	156	4.8
37	4 39.3	4 40.0	4 26.5	37	1.1	97	3.0	157	4.8
38	4 39.5	4 40.3	4 26.8	38	1.2	98	3.0	158	4.9
39	4 39.8	4 40.5	4 27.0	39	1.2	99	3.1	159	4.9
40	4 40.0	4 40.8	4 27.2	40	1.2	100	3.1	160	4.9
41	4 40.3	4 41.0	4 27.5	41	1.3	101	3.1	161	5.0
42	4 40.5	4 41.3	4 27.7	42	1.3	102	3.1	162	5.0
43	4 40.8	4 41.5	4 28.0	43	1.3	103	3.2	163	5.0
44	4 41.0	4 41.8	4 28.2	44	1.4	104	3.2	164	5.1
45	4 41.3	4 42.0	4 28.4	45	1.4	105	3.2	165	5.1
46	4 41.5	4 42.3	4 28.7	46	1.4	106	3.3	166	5.1
47	4 41.8	4 42.5	4 28.9	47	1.4	107	3.3	167	5.1
48	4 42.0	4 42.8	4 29.2	48	1.5	108	3.3	168	5.2
49	4 42.3	4 43.0	4 29.4	49	1.5	109	3.4	169	5.2
50	4 42.5	4 43.3	4 29.6	50	1.5	110	3.4	170	5.2
51	4 42.8	4 43.5	4 29.9	51	1.6	111	3.4	171	5.3
52	4 43.0	4 43.8	4 30.1	52	1.6	112	3.5	172	5.3
53	4 43.3	4 44.0	4 30.3	53	1.6	113	3.5	173	5.3
54	4 43.5	4 44.3	4 30.6	54	1.7	114	3.5	174	5.4
55	4 43.8	4 44.5	4 30.8	55	1.7	115	3.5	175	5.4
56	4 44.0	4 44.8	4 31.1	56	1.7	116	3.6	176	5.4
57	4 44.3	4 45.0	4 31.3	57	1.8	117	3.6	177	5.5
58	4 44.5	4 45.3	4 31.5	58	1.8	118	3.6	178	5.5
59	4 44.8	4 45.5	4 31.8	59	1.8	119	3.7	179	5.5
60	4 45.0	4 45.8	4 32.0	60	1.9	120	3.7	180	5.6

19m

Sec.	SUN PLANET	♈	MOON	code	corr'n	code	corr'n	code	corr'n
	° ′	° ′	° ′		′		′		′
0	4 45.0	4 45.8	4 32.0	0	0.0	60	2.0	120	3.9
1	4 45.3	4 46.0	4 32.3	1	0.0	61	2.0	121	3.9
2	4 45.5	4 46.3	4 32.5	2	0.1	62	2.0	122	4.0
3	4 45.8	4 46.5	4 32.7	3	0.1	63	2.0	123	4.0
4	4 46.0	4 46.8	4 33.0	4	0.1	64	2.1	124	4.0
5	4 46.3	4 47.0	4 33.2	5	0.2	65	2.1	125	4.1
6	4 46.5	4 47.3	4 33.4	6	0.2	66	2.1	126	4.1
7	4 46.8	4 47.5	4 33.7	7	0.2	67	2.2	127	4.1
8	4 47.0	4 47.8	4 33.9	8	0.3	68	2.2	128	4.2
9	4 47.3	4 48.0	4 34.2	9	0.3	69	2.2	129	4.2
10	4 47.5	4 48.3	4 34.4	10	0.3	70	2.3	130	4.2
11	4 47.8	4 48.5	4 34.6	11	0.4	71	2.3	131	4.3
12	4 48.0	4 48.8	4 34.9	12	0.4	72	2.3	132	4.3
13	4 48.3	4 49.0	4 35.1	13	0.4	73	2.4	133	4.3
14	4 48.5	4 49.3	4 35.4	14	0.5	74	2.4	134	4.4
15	4 48.8	4 49.5	4 35.6	15	0.5	75	2.4	135	4.4
16	4 49.0	4 49.8	4 35.8	16	0.5	76	2.5	136	4.4
17	4 49.3	4 50.0	4 36.1	17	0.6	77	2.5	137	4.5
18	4 49.5	4 50.3	4 36.3	18	0.6	78	2.5	138	4.5
19	4 49.8	4 50.5	4 36.6	19	0.6	79	2.6	139	4.5
20	4 50.0	4 50.8	4 36.8	20	0.7	80	2.6	140	4.6
21	4 50.3	4 51.0	4 37.0	21	0.7	81	2.6	141	4.6
22	4 50.5	4 51.3	4 37.3	22	0.7	82	2.7	142	4.6
23	4 50.8	4 51.5	4 37.5	23	0.7	83	2.7	143	4.6
24	4 51.0	4 51.8	4 37.7	24	0.8	84	2.7	144	4.7
25	4 51.3	4 52.0	4 38.0	25	0.8	85	2.8	145	4.7
26	4 51.5	4 52.3	4 38.2	26	0.8	86	2.8	146	4.7
27	4 51.8	4 52.5	4 38.5	27	0.9	87	2.8	147	4.8
28	4 52.0	4 52.8	4 38.7	28	0.9	88	2.9	148	4.8
29	4 52.3	4 53.1	4 38.9	29	0.9	89	2.9	149	4.8
30	4 52.5	4 53.3	4 39.2	30	1.0	90	2.9	150	4.9
31	4 52.8	4 53.6	4 39.4	31	1.0	91	3.0	151	4.9
32	4 53.0	4 53.8	4 39.7	32	1.0	92	3.0	152	4.9
33	4 53.3	4 54.1	4 39.9	33	1.1	93	3.0	153	5.0
34	4 53.5	4 54.3	4 40.1	34	1.1	94	3.1	154	5.0
35	4 53.8	4 54.6	4 40.4	35	1.1	95	3.1	155	5.0
36	4 54.0	4 54.8	4 40.6	36	1.2	96	3.1	156	5.1
37	4 54.3	4 55.1	4 40.8	37	1.2	97	3.2	157	5.1
38	4 54.5	4 55.3	4 41.1	38	1.2	98	3.2	158	5.1
39	4 54.8	4 55.6	4 41.3	39	1.3	99	3.2	159	5.2
40	4 55.0	4 55.8	4 41.6	40	1.3	100	3.3	160	5.2
41	4 55.3	4 56.1	4 41.8	41	1.3	101	3.3	161	5.2
42	4 55.5	4 56.3	4 42.0	42	1.4	102	3.3	162	5.3
43	4 55.8	4 56.6	4 42.3	43	1.4	103	3.3	163	5.3
44	4 56.0	4 56.8	4 42.5	44	1.4	104	3.4	164	5.3
45	4 56.3	4 57.1	4 42.8	45	1.5	105	3.4	165	5.4
46	4 56.5	4 57.3	4 43.0	46	1.5	106	3.4	166	5.4
47	4 56.8	4 57.6	4 43.2	47	1.5	107	3.5	167	5.4
48	4 57.0	4 57.8	4 43.5	48	1.6	108	3.5	168	5.5
49	4 57.3	4 58.1	4 43.7	49	1.6	109	3.5	169	5.5
50	4 57.5	4 58.3	4 43.9	50	1.6	110	3.6	170	5.5
51	4 57.8	4 58.6	4 44.2	51	1.7	111	3.6	171	5.6
52	4 58.0	4 58.8	4 44.4	52	1.7	112	3.6	172	5.6
53	4 58.3	4 59.1	4 44.7	53	1.7	113	3.7	173	5.6
54	4 58.5	4 59.3	4 44.9	54	1.8	114	3.7	174	5.7
55	4 58.8	4 59.6	4 45.1	55	1.8	115	3.7	175	5.7
56	4 59.0	4 59.8	4 45.4	56	1.8	116	3.8	176	5.7
57	4 59.3	5 00.1	4 45.6	57	1.9	117	3.8	177	5.8
58	4 59.5	5 00.3	4 45.9	58	1.9	118	3.8	178	5.8
59	4 59.8	5 00.6	4 46.1	59	1.9	119	3.9	179	5.8
60	5 00.0	5 00.8	4 46.3	60	2.0	120	3.9	180	5.9

20m

Sec.	SUN PLANET	♈	MOON	code	corr'n	code	corr'n	code	corr'n
	° ′	° ′	° ′		′		′		′
0	5 00.0	5 00.8	4 46.3	0	0.0	60	2.1	120	4.1
1	5 00.3	5 01.1	4 46.6	1	0.0	61	2.1	121	4.1
2	5 00.5	5 01.3	4 46.8	2	0.1	62	2.1	122	4.2
3	5 00.8	5 01.6	4 47.0	3	0.1	63	2.2	123	4.2
4	5 01.0	5 01.8	4 47.3	4	0.1	64	2.2	124	4.2
5	5 01.3	5 02.1	4 47.5	5	0.2	65	2.2	125	4.3
6	5 01.5	5 02.3	4 47.8	6	0.2	66	2.3	126	4.3
7	5 01.8	5 02.6	4 48.0	7	0.2	67	2.3	127	4.3
8	5 02.0	5 02.8	4 48.2	8	0.3	68	2.3	128	4.4
9	5 02.3	5 03.1	4 48.5	9	0.3	69	2.4	129	4.4
10	5 02.5	5 03.3	4 48.7	10	0.3	70	2.4	130	4.4
11	5 02.8	5 03.6	4 49.0	11	0.4	71	2.4	131	4.5
12	5 03.0	5 03.8	4 49.2	12	0.4	72	2.5	132	4.5
13	5 03.3	5 04.1	4 49.4	13	0.4	73	2.5	133	4.5
14	5 03.5	5 04.3	4 49.7	14	0.5	74	2.5	134	4.6
15	5 03.8	5 04.6	4 49.9	15	0.5	75	2.6	135	4.6
16	5 04.0	5 04.8	4 50.2	16	0.5	76	2.6	136	4.6
17	5 04.3	5 05.1	4 50.4	17	0.6	77	2.6	137	4.7
18	5 04.5	5 05.3	4 50.6	18	0.6	78	2.7	138	4.7
19	5 04.8	5 05.6	4 50.9	19	0.6	79	2.7	139	4.7
20	5 05.0	5 05.8	4 51.1	20	0.7	80	2.7	140	4.8
21	5 05.3	5 06.1	4 51.3	21	0.7	81	2.8	141	4.8
22	5 05.5	5 06.3	4 51.6	22	0.8	82	2.8	142	4.9
23	5 05.8	5 06.6	4 51.8	23	0.8	83	2.8	143	4.9
24	5 06.0	5 06.8	4 52.1	24	0.8	84	2.9	144	4.9
25	5 06.3	5 07.1	4 52.3	25	0.9	85	2.9	145	5.0
26	5 06.5	5 07.3	4 52.5	26	0.9	86	2.9	146	5.0
27	5 06.8	5 07.6	4 52.8	27	0.9	87	3.0	147	5.0
28	5 07.0	5 07.8	4 53.0	28	1.0	88	3.0	148	5.1
29	5 07.3	5 08.1	4 53.3	29	1.0	89	3.0	149	5.1
30	5 07.5	5 08.3	4 53.5	30	1.0	90	3.1	150	5.1
31	5 07.8	5 08.6	4 53.7	31	1.1	91	3.1	151	5.2
32	5 08.0	5 08.8	4 54.0	32	1.1	92	3.1	152	5.2
33	5 08.3	5 09.1	4 54.2	33	1.1	93	3.2	153	5.2
34	5 08.5	5 09.3	4 54.4	34	1.2	94	3.2	154	5.3
35	5 08.8	5 09.6	4 54.7	35	1.2	95	3.2	155	5.3
36	5 09.0	5 09.8	4 54.9	36	1.2	96	3.3	156	5.3
37	5 09.3	5 10.1	4 55.2	37	1.3	97	3.3	157	5.4
38	5 09.5	5 10.3	4 55.4	38	1.3	98	3.3	158	5.4
39	5 09.8	5 10.6	4 55.6	39	1.3	99	3.4	159	5.4
40	5 10.0	5 10.8	4 55.9	40	1.4	100	3.4	160	5.5
41	5 10.3	5 11.1	4 56.1	41	1.4	101	3.5	161	5.5
42	5 10.5	5 11.4	4 56.4	42	1.4	102	3.5	162	5.5
43	5 10.8	5 11.6	4 56.6	43	1.5	103	3.5	163	5.6
44	5 11.0	5 11.9	4 56.8	44	1.5	104	3.6	164	5.6
45	5 11.3	5 12.1	4 57.1	45	1.5	105	3.6	165	5.6
46	5 11.5	5 12.4	4 57.3	46	1.6	106	3.6	166	5.7
47	5 11.8	5 12.6	4 57.5	47	1.6	107	3.7	167	5.7
48	5 12.0	5 12.9	4 57.8	48	1.6	108	3.7	168	5.7
49	5 12.3	5 13.1	4 58.0	49	1.7	109	3.7	169	5.8
50	5 12.5	5 13.4	4 58.3	50	1.7	110	3.8	170	5.8
51	5 12.8	5 13.6	4 58.5	51	1.7	111	3.8	171	5.8
52	5 13.0	5 13.9	4 58.7	52	1.8	112	3.8	172	5.9
53	5 13.3	5 14.1	4 59.0	53	1.8	113	3.9	173	5.9
54	5 13.5	5 14.4	4 59.2	54	1.8	114	3.9	174	5.9
55	5 13.8	5 14.6	4 59.5	55	1.9	115	3.9	175	6.0
56	5 14.0	5 14.9	4 59.7	56	1.9	116	4.0	176	6.0
57	5 14.3	5 15.1	4 59.9	57	1.9	117	4.0	177	6.0
58	5 14.5	5 15.4	5 00.2	58	2.0	118	4.0	178	6.1
59	5 14.8	5 15.6	5 00.4	59	2.0	119	4.1	179	6.1
60	5 15.0	5 15.9	5 00.7	60	2.1	120	4.1	180	6.2

21m

Sec.	SUN PLANET	♈	MOON	code	corr'n	code	corr'n	code	corr'n
	° ′	° ′	° ′		′		′		′
0	5 15.0	5 15.9	5 00.7	0	0.0	60	2.2	120	4.3
1	5 15.3	5 16.1	5 00.9	1	0.0	61	2.2	121	4.3
2	5 15.5	5 16.4	5 01.1	2	0.1	62	2.2	122	4.4
3	5 15.8	5 16.6	5 01.4	3	0.1	63	2.3	123	4.4
4	5 16.0	5 16.9	5 01.6	4	0.1	64	2.3	124	4.4
5	5 16.3	5 17.1	5 01.8	5	0.2	65	2.3	125	4.5
6	5 16.5	5 17.4	5 02.1	6	0.2	66	2.4	126	4.5
7	5 16.8	5 17.6	5 02.3	7	0.3	67	2.4	127	4.6
8	5 17.0	5 17.9	5 02.6	8	0.3	68	2.4	128	4.6
9	5 17.3	5 18.1	5 02.8	9	0.3	69	2.5	129	4.6
10	5 17.5	5 18.4	5 03.0	10	0.4	70	2.5	130	4.7
11	5 17.8	5 18.6	5 03.3	11	0.4	71	2.5	131	4.7
12	5 18.0	5 18.9	5 03.5	12	0.4	72	2.6	132	4.7
13	5 18.3	5 19.1	5 03.8	13	0.5	73	2.6	133	4.8
14	5 18.5	5 19.4	5 04.0	14	0.5	74	2.7	134	4.8
15	5 18.8	5 19.6	5 04.2	15	0.5	75	2.7	135	4.8
16	5 19.0	5 19.9	5 04.5	16	0.6	76	2.7	136	4.9
17	5 19.3	5 20.1	5 04.7	17	0.6	77	2.8	137	4.9
18	5 19.5	5 20.4	5 04.9	18	0.6	78	2.8	138	4.9
19	5 19.8	5 20.6	5 05.2	19	0.7	79	2.8	139	5.0
20	5 20.0	5 20.9	5 05.4	20	0.7	80	2.9	140	5.0
21	5 20.3	5 21.1	5 05.7	21	0.8	81	2.9	141	5.1
22	5 20.5	5 21.4	5 05.9	22	0.8	82	2.9	142	5.1
23	5 20.8	5 21.6	5 06.1	23	0.8	83	3.0	143	5.1
24	5 21.0	5 21.9	5 06.4	24	0.9	84	3.0	144	5.2
25	5 21.3	5 22.1	5 06.6	25	0.9	85	3.0	145	5.2
26	5 21.5	5 22.4	5 06.9	26	0.9	86	3.1	146	5.2
27	5 21.8	5 22.6	5 07.1	27	1.0	87	3.1	147	5.3
28	5 22.0	5 22.9	5 07.3	28	1.0	88	3.2	148	5.3
29	5 22.3	5 23.1	5 07.6	29	1.0	89	3.2	149	5.3
30	5 22.5	5 23.4	5 07.8	30	1.1	90	3.2	150	5.4
31	5 22.8	5 23.6	5 08.0	31	1.1	91	3.3	151	5.4
32	5 23.0	5 23.9	5 08.3	32	1.1	92	3.3	152	5.4
33	5 23.3	5 24.1	5 08.5	33	1.2	93	3.3	153	5.5
34	5 23.5	5 24.4	5 08.8	34	1.2	94	3.4	154	5.5
35	5 23.8	5 24.6	5 09.0	35	1.3	95	3.4	155	5.6
36	5 24.0	5 24.9	5 09.2	36	1.3	96	3.4	156	5.6
37	5 24.3	5 25.1	5 09.5	37	1.3	97	3.5	157	5.6
38	5 24.5	5 25.4	5 09.7	38	1.4	98	3.5	158	5.7
39	5 24.8	5 25.6	5 10.0	39	1.4	99	3.5	159	5.7
40	5 25.0	5 25.9	5 10.2	40	1.4	100	3.6	160	5.7
41	5 25.3	5 26.1	5 10.4	41	1.5	101	3.6	161	5.8
42	5 25.5	5 26.4	5 10.7	42	1.5	102	3.7	162	5.8
43	5 25.8	5 26.6	5 10.9	43	1.5	103	3.7	163	5.8
44	5 26.0	5 26.9	5 11.1	44	1.6	104	3.7	164	5.9
45	5 26.3	5 27.1	5 11.4	45	1.6	105	3.8	165	5.9
46	5 26.5	5 27.4	5 11.6	46	1.6	106	3.8	166	5.9
47	5 26.8	5 27.6	5 11.9	47	1.7	107	3.8	167	6.0
48	5 27.0	5 27.9	5 12.1	48	1.7	108	3.9	168	6.0
49	5 27.3	5 28.1	5 12.3	49	1.8	109	3.9	169	6.1
50	5 27.5	5 28.4	5 12.6	50	1.8	110	3.9	170	6.1
51	5 27.8	5 28.6	5 12.8	51	1.8	111	4.0	171	6.1
52	5 28.0	5 28.9	5 13.1	52	1.9	112	4.0	172	6.2
53	5 28.3	5 29.1	5 13.3	53	1.9	113	4.0	173	6.2
54	5 28.5	5 29.4	5 13.5	54	1.9	114	4.1	174	6.2
55	5 28.8	5 29.7	5 13.8	55	2.0	115	4.1	175	6.3
56	5 29.0	5 29.9	5 14.0	56	2.0	116	4.2	176	6.3
57	5 29.3	5 30.2	5 14.3	57	2.0	117	4.2	177	6.3
58	5 29.5	5 30.4	5 14.5	58	2.1	118	4.2	178	6.4
59	5 29.8	5 30.7	5 14.7	59	2.1	119	4.3	179	6.4
60	5 30.0	5 30.9	5 15.0	60	2.2	120	4.3	180	6.5

22m

Sec.	SUN PLANET	♈	MOON	code	corr'n	code	corr'n	code	corr'n
	° ′	° ′	° ′		′		′		′
0	5 30.0	5 30.9	5 15.0	0	0.0	60	2.3	120	4.5
1	5 30.3	5 31.2	5 15.2	1	0.0	61	2.3	121	4.5
2	5 30.5	5 31.4	5 15.4	2	0.1	62	2.3	122	4.6
3	5 30.8	5 31.7	5 15.7	3	0.1	63	2.4	123	4.6
4	5 31.0	5 31.9	5 15.9	4	0.2	64	2.4	124	4.7
5	5 31.3	5 32.2	5 16.2	5	0.2	65	2.4	125	4.7
6	5 31.5	5 32.4	5 16.4	6	0.2	66	2.5	126	4.7
7	5 31.8	5 32.7	5 16.6	7	0.3	67	2.5	127	4.8
8	5 32.0	5 32.9	5 16.9	8	0.3	68	2.6	128	4.8
9	5 32.3	5 33.2	5 17.1	9	0.3	69	2.6	129	4.8
10	5 32.5	5 33.4	5 17.4	10	0.4	70	2.6	130	4.9
11	5 32.8	5 33.7	5 17.6	11	0.4	71	2.7	131	4.9
12	5 33.0	5 33.9	5 17.8	12	0.5	72	2.7	132	5.0
13	5 33.3	5 34.2	5 18.1	13	0.5	73	2.7	133	5.0
14	5 33.5	5 34.4	5 18.3	14	0.5	74	2.8	134	5.0
15	5 33.8	5 34.7	5 18.5	15	0.6	75	2.8	135	5.1
16	5 34.0	5 34.9	5 18.8	16	0.6	76	2.9	136	5.1
17	5 34.3	5 35.2	5 19.0	17	0.6	77	2.9	137	5.1
18	5 34.5	5 35.4	5 19.3	18	0.7	78	2.9	138	5.2
19	5 34.8	5 35.7	5 19.5	19	0.7	79	3.0	139	5.2
20	5 35.0	5 35.9	5 19.7	20	0.8	80	3.0	140	5.3
21	5 35.3	5 36.2	5 20.0	21	0.8	81	3.0	141	5.3
22	5 35.5	5 36.4	5 20.2	22	0.8	82	3.1	142	5.3
23	5 35.8	5 36.7	5 20.5	23	0.9	83	3.1	143	5.4
24	5 36.0	5 36.9	5 20.7	24	0.9	84	3.2	144	5.4
25	5 36.3	5 37.2	5 20.9	25	0.9	85	3.2	145	5.4
26	5 36.5	5 37.4	5 21.2	26	1.0	86	3.2	146	5.5
27	5 36.8	5 37.7	5 21.4	27	1.0	87	3.3	147	5.5
28	5 37.0	5 37.9	5 21.6	28	1.1	88	3.3	148	5.6
29	5 37.3	5 38.2	5 21.9	29	1.1	89	3.3	149	5.6
30	5 37.5	5 38.4	5 22.1	30	1.1	90	3.4	150	5.6
31	5 37.8	5 38.7	5 22.4	31	1.2	91	3.4	151	5.7
32	5 38.0	5 38.9	5 22.6	32	1.2	92	3.5	152	5.7
33	5 38.3	5 39.2	5 22.8	33	1.2	93	3.5	153	5.7
34	5 38.5	5 39.4	5 23.1	34	1.3	94	3.5	154	5.8
35	5 38.8	5 39.7	5 23.3	35	1.3	95	3.6	155	5.8
36	5 39.0	5 39.9	5 23.6	36	1.4	96	3.6	156	5.9
37	5 39.3	5 40.2	5 23.8	37	1.4	97	3.6	157	5.9
38	5 39.5	5 40.4	5 24.0	38	1.4	98	3.7	158	5.9
39	5 39.8	5 40.7	5 24.3	39	1.5	99	3.7	159	6.0
40	5 40.0	5 40.9	5 24.5	40	1.5	100	3.8	160	6.0
41	5 40.3	5 41.2	5 24.7	41	1.5	101	3.8	161	6.0
42	5 40.5	5 41.4	5 25.0	42	1.6	102	3.8	162	6.1
43	5 40.8	5 41.7	5 25.2	43	1.6	103	3.9	163	6.1
44	5 41.0	5 41.9	5 25.5	44	1.7	104	3.9	164	6.2
45	5 41.3	5 42.2	5 25.7	45	1.7	105	3.9	165	6.2
46	5 41.5	5 42.4	5 25.9	46	1.7	106	4.0	166	6.2
47	5 41.8	5 42.7	5 26.2	47	1.8	107	4.0	167	6.3
48	5 42.0	5 42.9	5 26.4	48	1.8	108	4.1	168	6.3
49	5 42.3	5 43.2	5 26.7	49	1.8	109	4.1	169	6.3
50	5 42.5	5 43.4	5 26.9	50	1.9	110	4.1	170	6.4
51	5 42.8	5 43.7	5 27.1	51	1.9	111	4.2	171	6.4
52	5 43.0	5 43.9	5 27.4	52	2.0	112	4.2	172	6.5
53	5 43.3	5 44.2	5 27.6	53	2.0	113	4.2	173	6.5
54	5 43.5	5 44.4	5 27.9	54	2.0	114	4.3	174	6.5
55	5 43.8	5 44.7	5 28.1	55	2.1	115	4.3	175	6.6
56	5 44.0	5 44.9	5 28.3	56	2.1	116	4.4	176	6.6
57	5 44.3	5 45.2	5 28.6	57	2.1	117	4.4	177	6.6
58	5 44.5	5 45.4	5 28.8	58	2.2	118	4.4	178	6.7
59	5 44.8	5 45.7	5 29.0	59	2.2	119	4.5	179	6.7
60	5 45.0	5 45.9	5 29.3	60	2.3	120	4.5	180	6.8

23m

Sec.	SUN PLANET	♈	MOON	code	corr'n	code	corr'n	code	corr'n
	° ′	° ′	° ′		′		′		′
0	5 45.0	5 45.9	5 29.3	0	0.0	60	2.4	120	4.7
1	5 45.3	5 46.2	5 29.5	1	0.0	61	2.4	121	4.7
2	5 45.5	5 46.4	5 29.8	2	0.1	62	2.4	122	4.8
3	5 45.8	5 46.7	5 30.0	3	0.1	63	2.5	123	4.8
4	5 46.0	5 46.9	5 30.2	4	0.2	64	2.5	124	4.9
5	5 46.3	5 47.2	5 30.5	5	0.2	65	2.5	125	4.9
6	5 46.5	5 47.4	5 30.7	6	0.2	66	2.6	126	4.9
7	5 46.8	5 47.7	5 31.0	7	0.3	67	2.6	127	5.0
8	5 47.0	5 48.0	5 31.2	8	0.3	68	2.7	128	5.0
9	5 47.3	5 48.2	5 31.4	9	0.4	69	2.7	129	5.1
10	5 47.5	5 48.5	5 31.7	10	0.4	70	2.7	130	5.1
11	5 47.8	5 48.7	5 31.9	11	0.4	71	2.8	131	5.1
12	5 48.0	5 49.0	5 32.1	12	0.5	72	2.8	132	5.2
13	5 48.3	5 49.2	5 32.4	13	0.5	73	2.9	133	5.2
14	5 48.5	5 49.5	5 32.6	14	0.5	74	2.9	134	5.2
15	5 48.8	5 49.7	5 32.9	15	0.6	75	2.9	135	5.3
16	5 49.0	5 50.0	5 33.1	16	0.6	76	3.0	136	5.3
17	5 49.3	5 50.2	5 33.3	17	0.7	77	3.0	137	5.4
18	5 49.5	5 50.5	5 33.6	18	0.7	78	3.1	138	5.4
19	5 49.8	5 50.7	5 33.8	19	0.7	79	3.1	139	5.4
20	5 50.0	5 51.0	5 34.1	20	0.8	80	3.1	140	5.5
21	5 50.3	5 51.2	5 34.3	21	0.8	81	3.2	141	5.5
22	5 50.5	5 51.5	5 34.5	22	0.9	82	3.2	142	5.6
23	5 50.8	5 51.7	5 34.8	23	0.9	83	3.3	143	5.6
24	5 51.0	5 52.0	5 35.0	24	0.9	84	3.3	144	5.6
25	5 51.3	5 52.2	5 35.2	25	1.0	85	3.3	145	5.7
26	5 51.5	5 52.5	5 35.5	26	1.0	86	3.4	146	5.7
27	5 51.8	5 52.7	5 35.7	27	1.1	87	3.4	147	5.8
28	5 52.0	5 53.0	5 36.0	28	1.1	88	3.4	148	5.8
29	5 52.3	5 53.2	5 36.2	29	1.1	89	3.5	149	5.8
30	5 52.5	5 53.5	5 36.4	30	1.2	90	3.5	150	5.9
31	5 52.8	5 53.7	5 36.7	31	1.2	91	3.6	151	5.9
32	5 53.0	5 54.0	5 36.9	32	1.3	92	3.6	152	6.0
33	5 53.3	5 54.2	5 37.2	33	1.3	93	3.6	153	6.0
34	5 53.5	5 54.5	5 37.4	34	1.3	94	3.7	154	6.0
35	5 53.8	5 54.7	5 37.6	35	1.4	95	3.7	155	6.1
36	5 54.0	5 55.0	5 37.9	36	1.4	96	3.8	156	6.1
37	5 54.3	5 55.2	5 38.1	37	1.4	97	3.8	157	6.1
38	5 54.5	5 55.5	5 38.4	38	1.5	98	3.8	158	6.2
39	5 54.8	5 55.7	5 38.6	39	1.5	99	3.9	159	6.2
40	5 55.0	5 56.0	5 38.8	40	1.6	100	3.9	160	6.3
41	5 55.3	5 56.2	5 39.1	41	1.6	101	4.0	161	6.3
42	5 55.5	5 56.5	5 39.3	42	1.6	102	4.0	162	6.3
43	5 55.8	5 56.7	5 39.5	43	1.7	103	4.0	163	6.4
44	5 56.0	5 57.0	5 39.8	44	1.7	104	4.1	164	6.4
45	5 56.3	5 57.2	5 40.0	45	1.8	105	4.1	165	6.5
46	5 56.5	5 57.5	5 40.3	46	1.8	106	4.2	166	6.5
47	5 56.8	5 57.7	5 40.5	47	1.8	107	4.2	167	6.5
48	5 57.0	5 58.0	5 40.7	48	1.9	108	4.2	168	6.6
49	5 57.3	5 58.2	5 41.0	49	1.9	109	4.3	169	6.6
50	5 57.5	5 58.5	5 41.2	50	2.0	110	4.3	170	6.7
51	5 57.8	5 58.7	5 41.5	51	2.0	111	4.3	171	6.7
52	5 58.0	5 59.0	5 41.7	52	2.0	112	4.4	172	6.7
53	5 58.3	5 59.2	5 41.9	53	2.1	113	4.4	173	6.8
54	5 58.5	5 59.5	5 42.2	54	2.1	114	4.5	174	6.8
55	5 58.8	5 59.7	5 42.4	55	2.2	115	4.5	175	6.9
56	5 59.0	6 00.0	5 42.6	56	2.2	116	4.5	176	6.9
57	5 59.3	6 00.2	5 42.9	57	2.2	117	4.6	177	6.9
58	5 59.5	6 00.5	5 43.1	58	2.3	118	4.6	178	7.0
59	5 59.8	6 00.7	5 43.4	59	2.3	119	4.7	179	7.0
60	6 00.0	6 01.0	5 43.6	60	2.4	120	4.7	180	7.1

24m

Sec.	SUN PLANET	♈	MOON	code	corr'n	code	corr'n	code	corr'n
	° ′	° ′	° ′		′		′		′
0	6 00.0	6 01.0	5 43.6	0	0.0	60	2.5	120	4.9
1	6 00.3	6 01.2	5 43.8	1	0.0	61	2.5	121	4.9
2	6 00.5	6 01.5	5 44.1	2	0.1	62	2.5	122	5.0
3	6 00.8	6 01.7	5 44.3	3	0.1	63	2.6	123	5.0
4	6 01.0	6 02.0	5 44.6	4	0.2	64	2.6	124	5.1
5	6 01.3	6 02.2	5 44.8	5	0.2	65	2.7	125	5.1
6	6 01.5	6 02.5	5 45.0	6	0.2	66	2.7	126	5.1
7	6 01.8	6 02.7	5 45.3	7	0.3	67	2.7	127	5.2
8	6 02.0	6 03.0	5 45.5	8	0.3	68	2.8	128	5.2
9	6 02.3	6 03.2	5 45.7	9	0.4	69	2.8	129	5.3
10	6 02.5	6 03.5	5 46.0	10	0.4	70	2.9	130	5.3
11	6 02.8	6 03.7	5 46.2	11	0.4	71	2.9	131	5.3
12	6 03.0	6 04.0	5 46.5	12	0.5	72	2.9	132	5.4
13	6 03.3	6 04.2	5 46.7	13	0.5	73	3.0	133	5.4
14	6 03.5	6 04.5	5 46.9	14	0.6	74	3.0	134	5.5
15	6 03.8	6 04.7	5 47.2	15	0.6	75	3.1	135	5.5
16	6 04.0	6 05.0	5 47.4	16	0.7	76	3.1	136	5.6
17	6 04.3	6 05.2	5 47.7	17	0.7	77	3.1	137	5.6
18	6 04.5	6 05.5	5 47.9	18	0.7	78	3.2	138	5.6
19	6 04.8	6 05.7	5 48.1	19	0.8	79	3.2	139	5.7
20	6 05.0	6 06.0	5 48.4	20	0.8	80	3.3	140	5.7
21	6 05.3	6 06.3	5 48.6	21	0.9	81	3.3	141	5.8
22	6 05.5	6 06.5	5 48.8	22	0.9	82	3.3	142	5.8
23	6 05.8	6 06.8	5 49.1	23	0.9	83	3.4	143	5.8
24	6 06.0	6 07.0	5 49.3	24	1.0	84	3.4	144	5.9
25	6 06.3	6 07.3	5 49.6	25	1.0	85	3.5	145	5.9
26	6 06.5	6 07.5	5 49.8	26	1.1	86	3.5	146	6.0
27	6 06.8	6 07.8	5 50.0	27	1.1	87	3.6	147	6.0
28	6 07.0	6 08.0	5 50.3	28	1.1	88	3.6	148	6.0
29	6 07.3	6 08.3	5 50.5	29	1.2	89	3.6	149	6.1
30	6 07.5	6 08.5	5 50.8	30	1.2	90	3.7	150	6.1
31	6 07.8	6 08.8	5 51.0	31	1.3	91	3.7	151	6.2
32	6 08.0	6 09.0	5 51.2	32	1.3	92	3.8	152	6.2
33	6 08.3	6 09.3	5 51.5	33	1.3	93	3.8	153	6.2
34	6 08.5	6 09.5	5 51.7	34	1.4	94	3.8	154	6.3
35	6 08.8	6 09.8	5 52.0	35	1.4	95	3.9	155	6.3
36	6 09.0	6 10.0	5 52.2	36	1.5	96	3.9	156	6.4
37	6 09.3	6 10.3	5 52.4	37	1.5	97	4.0	157	6.4
38	6 09.5	6 10.5	5 52.7	38	1.6	98	4.0	158	6.5
39	6 09.8	6 10.8	5 52.9	39	1.6	99	4.0	159	6.5
40	6 10.0	6 11.0	5 53.1	40	1.6	100	4.1	160	6.5
41	6 10.3	6 11.3	5 53.4	41	1.7	101	4.1	161	6.6
42	6 10.5	6 11.5	5 53.6	42	1.7	102	4.2	162	6.6
43	6 10.8	6 11.8	5 53.9	43	1.8	103	4.2	163	6.7
44	6 11.0	6 12.0	5 54.1	44	1.8	104	4.2	164	6.7
45	6 11.3	6 12.3	5 54.3	45	1.8	105	4.3	165	6.7
46	6 11.5	6 12.5	5 54.6	46	1.9	106	4.3	166	6.8
47	6 11.8	6 12.8	5 54.8	47	1.9	107	4.4	167	6.8
48	6 12.0	6 13.0	5 55.1	48	2.0	108	4.4	168	6.9
49	6 12.3	6 13.3	5 55.3	49	2.0	109	4.5	169	6.9
50	6 12.5	6 13.5	5 55.5	50	2.0	110	4.5	170	6.9
51	6 12.8	6 13.8	5 55.8	51	2.1	111	4.5	171	7.0
52	6 13.0	6 14.0	5 56.0	52	2.1	112	4.6	172	7.0
53	6 13.3	6 14.3	5 56.2	53	2.2	113	4.6	173	7.1
54	6 13.5	6 14.5	5 56.5	54	2.2	114	4.7	174	7.1
55	6 13.8	6 14.8	5 56.7	55	2.2	115	4.7	175	7.1
56	6 14.0	6 15.0	5 57.0	56	2.3	116	4.7	176	7.2
57	6 14.3	6 15.3	5 57.2	57	2.3	117	4.8	177	7.2
58	6 14.5	6 15.5	5 57.4	58	2.4	118	4.8	178	7.3
59	6 14.8	6 15.8	5 57.7	59	2.4	119	4.9	179	7.3
60	6 15.0	6 16.0	5 57.9	60	2.5	120	4.9	180	7.4

25m

Sec.	SUN PLANET	♈	MOON	code	corr'n	code	corr'n	code	corr'n
	° ′	° ′	° ′		′		′		′
0	6 15.0	6 16.0	5 57.9	0	0.0	60	2.6	120	5.1
1	6 15.3	6 16.3	5 58.2	1	0.0	61	2.6	121	5.1
2	6 15.5	6 16.5	5 58.4	2	0.1	62	2.6	122	5.2
3	6 15.8	6 16.8	5 58.6	3	0.1	63	2.7	123	5.2
4	6 16.0	6 17.0	5 58.9	4	0.2	64	2.7	124	5.3
5	6 16.3	6 17.3	5 59.1	5	0.2	65	2.8	125	5.3
6	6 16.5	6 17.5	5 59.3	6	0.3	66	2.8	126	5.4
7	6 16.8	6 17.8	5 59.6	7	0.3	67	2.8	127	5.4
8	6 17.0	6 18.0	5 59.8	8	0.3	68	2.9	128	5.4
9	6 17.3	6 18.3	6 00.1	9	0.4	69	2.9	129	5.5
10	6 17.5	6 18.5	6 00.3	10	0.4	70	3.0	130	5.5
11	6 17.8	6 18.8	6 00.5	11	0.5	71	3.0	131	5.6
12	6 18.0	6 19.0	6 00.8	12	0.5	72	3.1	132	5.6
13	6 18.3	6 19.3	6 01.0	13	0.6	73	3.1	133	5.7
14	6 18.5	6 19.5	6 01.3	14	0.6	74	3.1	134	5.7
15	6 18.8	6 19.8	6 01.5	15	0.6	75	3.2	135	5.7
16	6 19.0	6 20.0	6 01.7	16	0.7	76	3.2	136	5.8
17	6 19.3	6 20.3	6 02.0	17	0.7	77	3.3	137	5.8
18	6 19.5	6 20.5	6 02.2	18	0.8	78	3.3	138	5.9
19	6 19.8	6 20.8	6 02.5	19	0.8	79	3.4	139	5.9
20	6 20.0	6 21.0	6 02.7	20	0.9	80	3.4	140	6.0
21	6 20.3	6 21.3	6 02.9	21	0.9	81	3.4	141	6.0
22	6 20.5	6 21.5	6 03.2	22	0.9	82	3.5	142	6.0
23	6 20.8	6 21.8	6 03.4	23	1.0	83	3.5	143	6.1
24	6 21.0	6 22.0	6 03.6	24	1.0	84	3.6	144	6.1
25	6 21.3	6 22.3	6 03.9	25	1.1	85	3.6	145	6.2
26	6 21.5	6 22.5	6 04.1	26	1.1	86	3.7	146	6.2
27	6 21.8	6 22.8	6 04.4	27	1.1	87	3.7	147	6.2
28	6 22.0	6 23.0	6 04.6	28	1.2	88	3.7	148	6.3
29	6 22.3	6 23.3	6 04.8	29	1.2	89	3.8	149	6.3
30	6 22.5	6 23.5	6 05.1	30	1.3	90	3.8	150	6.4
31	6 22.8	6 23.8	6 05.3	31	1.3	91	3.9	151	6.4
32	6 23.0	6 24.0	6 05.6	32	1.4	92	3.9	152	6.5
33	6 23.3	6 24.3	6 05.8	33	1.4	93	4.0	153	6.5
34	6 23.5	6 24.5	6 06.0	34	1.4	94	4.0	154	6.5
35	6 23.8	6 24.8	6 06.3	35	1.5	95	4.0	155	6.6
36	6 24.0	6 25.1	6 06.5	36	1.5	96	4.1	156	6.6
37	6 24.3	6 25.3	6 06.7	37	1.6	97	4.1	157	6.7
38	6 24.5	6 25.6	6 07.0	38	1.6	98	4.2	158	6.7
39	6 24.8	6 25.8	6 07.2	39	1.7	99	4.2	159	6.8
40	6 25.0	6 26.1	6 07.5	40	1.7	100	4.3	160	6.8
41	6 25.3	6 26.3	6 07.7	41	1.7	101	4.3	161	6.8
42	6 25.5	6 26.6	6 07.9	42	1.8	102	4.3	162	6.9
43	6 25.8	6 26.8	6 08.2	43	1.8	103	4.4	163	6.9
44	6 26.0	6 27.1	6 08.4	44	1.9	104	4.4	164	7.0
45	6 26.3	6 27.3	6 08.7	45	1.9	105	4.5	165	7.0
46	6 26.5	6 27.6	6 08.9	46	2.0	106	4.5	166	7.1
47	6 26.8	6 27.8	6 09.1	47	2.0	107	4.5	167	7.1
48	6 27.0	6 28.1	6 09.4	48	2.0	108	4.6	168	7.1
49	6 27.3	6 28.3	6 09.6	49	2.1	109	4.6	169	7.2
50	6 27.5	6 28.6	6 09.8	50	2.1	110	4.7	170	7.2
51	6 27.8	6 28.8	6 10.1	51	2.2	111	4.7	171	7.3
52	6 28.0	6 29.1	6 10.3	52	2.2	112	4.8	172	7.3
53	6 28.3	6 29.3	6 10.6	53	2.3	113	4.8	173	7.4
54	6 28.5	6 29.6	6 10.8	54	2.3	114	4.8	174	7.4
55	6 28.8	6 29.8	6 11.0	55	2.3	115	4.9	175	7.4
56	6 29.0	6 30.1	6 11.3	56	2.4	116	4.9	176	7.5
57	6 29.3	6 30.3	6 11.5	57	2.4	117	5.0	177	7.5
58	6 29.5	6 30.6	6 11.8	58	2.5	118	5.0	178	7.6
59	6 29.8	6 30.8	6 12.0	59	2.5	119	5.1	179	7.6
60	6 30.0	6 31.1	6 12.2	60	2.6	120	5.1	180	7.7

26^m

Sec.	SUN PLANET	♈	MOON	code	corr'n	code	corr'n	code	corr'n
	° ′	° ′	° ′		′		′		′
0	6 30.0	6 31.1	6 12.2	0	0.0	60	2.7	120	5.3
1	6 30.3	6 31.3	6 12.5	1	0.0	61	2.7	121	5.3
2	6 30.5	6 31.6	6 12.7	2	0.1	62	2.7	122	5.4
3	6 30.8	6 31.8	6 12.9	3	0.1	63	2.8	123	5.4
4	6 31.0	6 32.1	6 13.2	4	0.2	64	2.8	124	5.5
5	6 31.3	6 32.3	6 13.4	5	0.2	65	2.9	125	5.5
6	6 31.5	6 32.6	6 13.7	6	0.3	66	2.9	126	5.6
7	6 31.8	6 32.8	6 13.9	7	0.3	67	3.0	127	5.6
8	6 32.0	6 33.1	6 14.1	8	0.4	68	3.0	128	5.7
9	6 32.3	6 33.3	6 14.4	9	0.4	69	3.0	129	5.7
10	6 32.5	6 33.6	6 14.6	10	0.4	70	3.1	130	5.7
11	6 32.8	6 33.8	6 14.9	11	0.5	71	3.1	131	5.8
12	6 33.0	6 34.1	6 15.1	12	0.5	72	3.2	132	5.8
13	6 33.3	6 34.3	6 15.3	13	0.6	73	3.2	133	5.9
14	6 33.5	6 34.6	6 15.6	14	0.6	74	3.3	134	5.9
15	6 33.8	6 34.8	6 15.8	15	0.7	75	3.3	135	6.0
16	6 34.0	6 35.1	6 16.1	16	0.7	76	3.4	136	6.0
17	6 34.3	6 35.3	6 16.3	17	0.8	77	3.4	137	6.1
18	6 34.5	6 35.6	6 16.5	18	0.8	78	3.4	138	6.1
19	6 34.8	6 35.8	6 16.8	19	0.8	79	3.5	139	6.1
20	6 35.0	6 36.1	6 17.0	20	0.9	80	3.5	140	6.2
21	6 35.3	6 36.3	6 17.2	21	0.9	81	3.6	141	6.2
22	6 35.5	6 36.6	6 17.5	22	1.0	82	3.6	142	6.3
23	6 35.8	6 36.8	6 17.7	23	1.0	83	3.7	143	6.3
24	6 36.0	6 37.1	6 18.0	24	1.1	84	3.7	144	6.4
25	6 36.3	6 37.3	6 18.2	25	1.1	85	3.8	145	6.4
26	6 36.5	6 37.6	6 18.4	26	1.1	86	3.8	146	6.4
27	6 36.8	6 37.8	6 18.7	27	1.2	87	3.8	147	6.5
28	6 37.0	6 38.1	6 18.9	28	1.2	88	3.9	148	6.5
29	6 37.3	6 38.3	6 19.2	29	1.3	89	3.9	149	6.6
30	6 37.5	6 38.6	6 19.4	30	1.3	90	4.0	150	6.6
31	6 37.8	6 38.8	6 19.6	31	1.4	91	4.0	151	6.7
32	6 38.0	6 39.1	6 19.9	32	1.4	92	4.1	152	6.7
33	6 38.3	6 39.3	6 20.1	33	1.5	93	4.1	153	6.8
34	6 38.5	6 39.6	6 20.3	34	1.5	94	4.2	154	6.8
35	6 38.8	6 39.8	6 20.6	35	1.5	95	4.2	155	6.8
36	6 39.0	6 40.1	6 20.8	36	1.6	96	4.2	156	6.9
37	6 39.3	6 40.3	6 21.1	37	1.6	97	4.3	157	6.9
38	6 39.5	6 40.6	6 21.3	38	1.7	98	4.3	158	7.0
39	6 39.8	6 40.8	6 21.5	39	1.7	99	4.4	159	7.0
40	6 40.0	6 41.1	6 21.8	40	1.8	100	4.4	160	7.1
41	6 40.3	6 41.3	6 22.0	41	1.8	101	4.5	161	7.1
42	6 40.5	6 41.6	6 22.3	42	1.9	102	4.5	162	7.2
43	6 40.8	6 41.8	6 22.5	43	1.9	103	4.5	163	7.2
44	6 41.0	6 42.1	6 22.7	44	1.9	104	4.6	164	7.2
45	6 41.3	6 42.3	6 23.0	45	2.0	105	4.6	165	7.3
46	6 41.5	6 42.6	6 23.2	46	2.0	106	4.7	166	7.3
47	6 41.8	6 42.8	6 23.4	47	2.1	107	4.7	167	7.4
48	6 42.0	6 43.1	6 23.7	48	2.1	108	4.8	168	7.4
49	6 42.3	6 43.4	6 23.9	49	2.2	109	4.8	169	7.5
50	6 42.5	6 43.6	6 24.2	50	2.2	110	4.9	170	7.5
51	6 42.8	6 43.9	6 24.4	51	2.3	111	4.9	171	7.6
52	6 43.0	6 44.1	6 24.6	52	2.3	112	4.9	172	7.6
53	6 43.3	6 44.4	6 24.9	53	2.3	113	5.0	173	7.6
54	6 43.5	6 44.6	6 25.1	54	2.4	114	5.0	174	7.7
55	6 43.8	6 44.9	6 25.4	55	2.4	115	5.1	175	7.7
56	6 44.0	6 45.1	6 25.6	56	2.5	116	5.1	176	7.8
57	6 44.3	6 45.4	6 25.8	57	2.5	117	5.2	177	7.8
58	6 44.5	6 45.6	6 26.1	58	2.6	118	5.2	178	7.9
59	6 44.8	6 45.9	6 26.3	59	2.6	119	5.3	179	7.9
60	6 45.0	6 46.1	6 26.6	60	2.7	120	5.3	180	8.0

27^m

Sec.	SUN PLANET	♈	MOON	code	corr'n	code	corr'n	code	corr'n
	° ′	° ′	° ′		′		′		′
0	6 45.0	6 46.1	6 26.6	0	0.0	60	2.8	120	5.5
1	6 45.3	6 46.4	6 26.8	1	0.0	61	2.8	121	5.5
2	6 45.5	6 46.6	6 27.0	2	0.1	62	2.8	122	5.6
3	6 45.8	6 46.9	6 27.3	3	0.1	63	2.9	123	5.6
4	6 46.0	6 47.1	6 27.5	4	0.2	64	2.9	124	5.7
5	6 46.3	6 47.4	6 27.7	5	0.2	65	3.0	125	5.7
6	6 46.5	6 47.6	6 28.0	6	0.3	66	3.0	126	5.8
7	6 46.8	6 47.9	6 28.2	7	0.3	67	3.1	127	5.8
8	6 47.0	6 48.1	6 28.5	8	0.4	68	3.1	128	5.9
9	6 47.3	6 48.4	6 28.7	9	0.4	69	3.2	129	5.9
10	6 47.5	6 48.6	6 28.9	10	0.5	70	3.2	130	6.0
11	6 47.8	6 48.9	6 29.2	11	0.5	71	3.3	131	6.0
12	6 48.0	6 49.1	6 29.4	12	0.6	72	3.3	132	6.1
13	6 48.3	6 49.4	6 29.7	13	0.6	73	3.3	133	6.1
14	6 48.5	6 49.6	6 29.9	14	0.6	74	3.4	134	6.1
15	6 48.8	6 49.9	6 30.1	15	0.7	75	3.4	135	6.2
16	6 49.0	6 50.1	6 30.4	16	0.7	76	3.5	136	6.2
17	6 49.3	6 50.4	6 30.6	17	0.8	77	3.5	137	6.3
18	6 49.5	6 50.6	6 30.8	18	0.8	78	3.6	138	6.3
19	6 49.8	6 50.9	6 31.1	19	0.9	79	3.6	139	6.4
20	6 50.0	6 51.1	6 31.3	20	0.9	80	3.7	140	6.4
21	6 50.3	6 51.4	6 31.6	21	1.0	81	3.7	141	6.5
22	6 50.5	6 51.6	6 31.8	22	1.0	82	3.8	142	6.5
23	6 50.8	6 51.9	6 32.0	23	1.1	83	3.8	143	6.6
24	6 51.0	6 52.1	6 32.3	24	1.1	84	3.9	144	6.6
25	6 51.3	6 52.4	6 32.5	25	1.1	85	3.9	145	6.6
26	6 51.5	6 52.6	6 32.8	26	1.2	86	3.9	146	6.7
27	6 51.8	6 52.9	6 33.0	27	1.2	87	4.0	147	6.7
28	6 52.0	6 53.1	6 33.2	28	1.3	88	4.0	148	6.8
29	6 52.3	6 53.4	6 33.5	29	1.3	89	4.1	149	6.8
30	6 52.5	6 53.6	6 33.7	30	1.4	90	4.1	150	6.9
31	6 52.8	6 53.9	6 33.9	31	1.4	91	4.2	151	6.9
32	6 53.0	6 54.1	6 34.2	32	1.5	92	4.2	152	7.0
33	6 53.3	6 54.4	6 34.4	33	1.5	93	4.3	153	7.0
34	6 53.5	6 54.6	6 34.7	34	1.6	94	4.3	154	7.1
35	6 53.8	6 54.9	6 34.9	35	1.6	95	4.4	155	7.1
36	6 54.0	6 55.1	6 35.1	36	1.7	96	4.4	156	7.2
37	6 54.3	6 55.4	6 35.4	37	1.7	97	4.4	157	7.2
38	6 54.5	6 55.6	6 35.6	38	1.7	98	4.5	158	7.2
39	6 54.8	6 55.9	6 35.9	39	1.8	99	4.5	159	7.3
40	6 55.0	6 56.1	6 36.1	40	1.8	100	4.6	160	7.3
41	6 55.3	6 56.4	6 36.3	41	1.9	101	4.6	161	7.4
42	6 55.5	6 56.6	6 36.6	42	1.9	102	4.7	162	7.4
43	6 55.8	6 56.9	6 36.8	43	2.0	103	4.7	163	7.5
44	6 56.0	6 57.1	6 37.0	44	2.0	104	4.8	164	7.5
45	6 56.3	6 57.4	6 37.3	45	2.1	105	4.8	165	7.6
46	6 56.5	6 57.6	6 37.5	46	2.1	106	4.9	166	7.6
47	6 56.8	6 57.9	6 37.8	47	2.2	107	4.9	167	7.7
48	6 57.0	6 58.1	6 38.0	48	2.2	108	5.0	168	7.7
49	6 57.3	6 58.4	6 38.2	49	2.2	109	5.0	169	7.7
50	6 57.5	6 58.6	6 38.5	50	2.3	110	5.0	170	7.8
51	6 57.8	6 58.9	6 38.7	51	2.3	111	5.1	171	7.8
52	6 58.0	6 59.1	6 39.0	52	2.4	112	5.1	172	7.9
53	6 58.3	6 59.4	6 39.2	53	2.4	113	5.2	173	7.9
54	6 58.5	6 59.6	6 39.4	54	2.5	114	5.2	174	8.0
55	6 58.8	6 59.9	6 39.7	55	2.5	115	5.3	175	8.0
56	6 59.0	7 00.1	6 39.9	56	2.6	116	5.3	176	8.1
57	6 59.3	7 00.4	6 40.2	57	2.6	117	5.4	177	8.1
58	6 59.5	7 00.6	6 40.4	58	2.7	118	5.4	178	8.2
59	6 59.8	7 00.9	6 40.6	59	2.7	119	5.5	179	8.2
60	7 00.0	7 01.1	6 40.9	60	2.8	120	5.5	180	8.3

28ᵐ

Sec.	SUN PLANET	♈	MOON	code	corr'n	code	corr'n	code	corr'n
	° ′	° ′	° ′		′		′		′
0	7 00.0	7 01.1	6 40.9	0	0.0	60	2.9	120	5.7
1	7 00.3	7 01.4	6 41.1	1	0.0	61	2.9	121	5.7
2	7 00.5	7 01.7	6 41.3	2	0.1	62	2.9	122	5.8
3	7 00.8	7 01.9	6 41.6	3	0.1	63	3.0	123	5.8
4	7 01.0	7 02.2	6 41.8	4	0.2	64	3.0	124	5.9
5	7 01.3	7 02.4	6 42.1	5	0.2	65	3.1	125	5.9
6	7 01.5	7 02.7	6 42.3	6	0.3	66	3.1	126	6.0
7	7 01.8	7 02.9	6 42.5	7	0.3	67	3.2	127	6.0
8	7 02.0	7 03.2	6 42.8	8	0.4	68	3.2	128	6.1
9	7 02.3	7 03.4	6 43.0	9	0.4	69	3.3	129	6.1
10	7 02.5	7 03.7	6 43.3	10	0.5	70	3.3	130	6.2
11	7 02.8	7 03.9	6 43.5	11	0.5	71	3.4	131	6.2
12	7 03.0	7 04.2	6 43.7	12	0.6	72	3.4	132	6.3
13	7 03.3	7 04.4	6 44.0	13	0.6	73	3.5	133	6.3
14	7 03.5	7 04.7	6 44.2	14	0.7	74	3.5	134	6.4
15	7 03.8	7 04.9	6 44.4	15	0.7	75	3.6	135	6.4
16	7 04.0	7 05.2	6 44.7	16	0.8	76	3.6	136	6.5
17	7 04.3	7 05.4	6 44.9	17	0.8	77	3.7	137	6.5
18	7 04.5	7 05.7	6 45.2	18	0.9	78	3.7	138	6.6
19	7 04.8	7 05.9	6 45.4	19	0.9	79	3.8	139	6.6
20	7 05.0	7 06.2	6 45.6	20	1.0	80	3.8	140	6.7
21	7 05.3	7 06.4	6 45.9	21	1.0	81	3.8	141	6.7
22	7 05.5	7 06.7	6 46.1	22	1.0	82	3.9	142	6.7
23	7 05.8	7 06.9	6 46.4	23	1.1	83	3.9	143	6.8
24	7 06.0	7 07.2	6 46.6	24	1.1	84	4.0	144	6.8
25	7 06.3	7 07.4	6 46.8	25	1.2	85	4.0	145	6.9
26	7 06.5	7 07.7	6 47.1	26	1.2	86	4.1	146	6.9
27	7 06.8	7 07.9	6 47.3	27	1.3	87	4.1	147	7.0
28	7 07.0	7 08.2	6 47.5	28	1.3	88	4.2	148	7.0
29	7 07.3	7 08.4	6 47.8	29	1.4	89	4.2	149	7.1
30	7 07.5	7 08.7	6 48.0	30	1.4	90	4.3	150	7.1
31	7 07.8	7 08.9	6 48.3	31	1.5	91	4.3	151	7.2
32	7 08.0	7 09.2	6 48.5	32	1.5	92	4.4	152	7.2
33	7 08.3	7 09.4	6 48.7	33	1.6	93	4.4	153	7.3
34	7 08.5	7 09.7	6 49.0	34	1.6	94	4.5	154	7.3
35	7 08.8	7 09.9	6 49.2	35	1.7	95	4.5	155	7.4
36	7 09.0	7 10.2	6 49.5	36	1.7	96	4.6	156	7.4
37	7 09.3	7 10.4	6 49.7	37	1.8	97	4.6	157	7.5
38	7 09.5	7 10.7	6 49.9	38	1.8	98	4.7	158	7.5
39	7 09.8	7 10.9	6 50.2	39	1.9	99	4.7	159	7.6
40	7 10.0	7 11.2	6 50.4	40	1.9	100	4.8	160	7.6
41	7 10.3	7 11.4	6 50.6	41	1.9	101	4.8	161	7.6
42	7 10.5	7 11.7	6 50.9	42	2.0	102	4.8	162	7.7
43	7 10.8	7 11.9	6 51.1	43	2.0	103	4.9	163	7.7
44	7 11.0	7 12.2	6 51.4	44	2.1	104	4.9	164	7.8
45	7 11.3	7 12.4	6 51.6	45	2.1	105	5.0	165	7.8
46	7 11.5	7 12.7	6 51.8	46	2.2	106	5.0	166	7.9
47	7 11.8	7 12.9	6 52.1	47	2.2	107	5.1	167	7.9
48	7 12.0	7 13.2	6 52.3	48	2.3	108	5.1	168	8.0
49	7 12.3	7 13.4	6 52.6	49	2.3	109	5.2	169	8.0
50	7 12.5	7 13.7	6 52.8	50	2.4	110	5.2	170	8.1
51	7 12.8	7 13.9	6 53.0	51	2.4	111	5.3	171	8.1
52	7 13.0	7 14.2	6 53.3	52	2.5	112	5.3	172	8.2
53	7 13.3	7 14.4	6 53.5	53	2.5	113	5.4	173	8.2
54	7 13.5	7 14.7	6 53.8	54	2.6	114	5.4	174	8.3
55	7 13.8	7 14.9	6 54.0	55	2.6	115	5.5	175	8.3
56	7 14.0	7 15.2	6 54.2	56	2.7	116	5.5	176	8.4
57	7 14.3	7 15.4	6 54.5	57	2.7	117	5.6	177	8.4
58	7 14.5	7 15.7	6 54.7	58	2.8	118	5.6	178	8.5
59	7 14.8	7 15.9	6 54.9	59	2.8	119	5.7	179	8.5
60	7 15.0	7 16.2	6 55.2	60	2.9	120	5.7	180	8.6

29ᵐ

Sec.	SUN PLANET	♈	MOON	code	corr'n	code	corr'n	code	corr'n
	° ′	° ′	° ′		′		′		′
0	7 15.0	7 16.2	6 55.2	0	0.0	60	3.0	120	5.9
1	7 15.3	7 16.4	6 55.4	1	0.0	61	3.0	121	5.9
2	7 15.5	7 16.7	6 55.7	2	0.1	62	3.0	122	6.0
3	7 15.8	7 16.9	6 55.9	3	0.1	63	3.1	123	6.0
4	7 16.0	7 17.2	6 56.1	4	0.2	64	3.1	124	6.1
5	7 16.3	7 17.4	6 56.4	5	0.2	65	3.2	125	6.1
6	7 16.5	7 17.7	6 56.6	6	0.3	66	3.2	126	6.2
7	7 16.8	7 17.9	6 56.9	7	0.3	67	3.3	127	6.2
8	7 17.0	7 18.2	6 57.1	8	0.4	68	3.3	128	6.3
9	7 17.3	7 18.4	6 57.3	9	0.4	69	3.4	129	6.3
10	7 17.5	7 18.7	6 57.6	10	0.5	70	3.4	130	6.4
11	7 17.8	7 18.9	6 57.8	11	0.5	71	3.5	131	6.4
12	7 18.0	7 19.2	6 58.0	12	0.6	72	3.5	132	6.5
13	7 18.3	7 19.4	6 58.3	13	0.6	73	3.6	133	6.5
14	7 18.5	7 19.7	6 58.5	14	0.7	74	3.6	134	6.6
15	7 18.8	7 20.0	6 58.8	15	0.7	75	3.7	135	6.6
16	7 19.0	7 20.2	6 59.0	16	0.8	76	3.7	136	6.7
17	7 19.3	7 20.5	6 59.2	17	0.8	77	3.8	137	6.7
18	7 19.5	7 20.7	6 59.5	18	0.9	78	3.8	138	6.8
19	7 19.8	7 21.0	6 59.7	19	0.9	79	3.9	139	6.8
20	7 20.0	7 21.2	7 00.0	20	1.0	80	3.9	140	6.9
21	7 20.3	7 21.5	7 00.2	21	1.0	81	4.0	141	6.9
22	7 20.5	7 21.7	7 00.4	22	1.1	82	4.0	142	7.0
23	7 20.8	7 22.0	7 00.7	23	1.1	83	4.1	143	7.0
24	7 21.0	7 22.2	7 00.9	24	1.2	84	4.1	144	7.1
25	7 21.3	7 22.5	7 01.1	25	1.2	85	4.2	145	7.1
26	7 21.5	7 22.7	7 01.4	26	1.3	86	4.2	146	7.2
27	7 21.8	7 23.0	7 01.6	27	1.3	87	4.3	147	7.2
28	7 22.0	7 23.2	7 01.9	28	1.4	88	4.3	148	7.3
29	7 22.3	7 23.5	7 02.1	29	1.4	89	4.4	149	7.3
30	7 22.5	7 23.7	7 02.3	30	1.5	90	4.4	150	7.4
31	7 22.8	7 24.0	7 02.6	31	1.5	91	4.5	151	7.4
32	7 23.0	7 24.2	7 02.8	32	1.6	92	4.5	152	7.5
33	7 23.3	7 24.5	7 03.1	33	1.6	93	4.6	153	7.5
34	7 23.5	7 24.7	7 03.3	34	1.7	94	4.6	154	7.6
35	7 23.8	7 25.0	7 03.5	35	1.7	95	4.7	155	7.6
36	7 24.0	7 25.2	7 03.8	36	1.8	96	4.7	156	7.7
37	7 24.3	7 25.5	7 04.0	37	1.8	97	4.8	157	7.7
38	7 24.5	7 25.7	7 04.3	38	1.9	98	4.8	158	7.8
39	7 24.8	7 26.0	7 04.5	39	1.9	99	4.9	159	7.8
40	7 25.0	7 26.2	7 04.7	40	2.0	100	4.9	160	7.9
41	7 25.3	7 26.5	7 05.0	41	2.0	101	5.0	161	7.9
42	7 25.5	7 26.7	7 05.2	42	2.1	102	5.0	162	8.0
43	7 25.8	7 27.0	7 05.4	43	2.1	103	5.1	163	8.0
44	7 26.0	7 27.2	7 05.7	44	2.2	104	5.1	164	8.1
45	7 26.3	7 27.5	7 05.9	45	2.2	105	5.2	165	8.1
46	7 26.5	7 27.7	7 06.2	46	2.3	106	5.2	166	8.2
47	7 26.8	7 28.0	7 06.4	47	2.3	107	5.3	167	8.2
48	7 27.0	7 28.2	7 06.6	48	2.4	108	5.3	168	8.3
49	7 27.3	7 28.5	7 06.9	49	2.4	109	5.4	169	8.3
50	7 27.5	7 28.7	7 07.1	50	2.5	110	5.4	170	8.4
51	7 27.8	7 29.0	7 07.4	51	2.5	111	5.5	171	8.4
52	7 28.0	7 29.2	7 07.6	52	2.6	112	5.5	172	8.5
53	7 28.3	7 29.5	7 07.8	53	2.6	113	5.6	173	8.5
54	7 28.5	7 29.7	7 08.1	54	2.7	114	5.6	174	8.6
55	7 28.8	7 30.0	7 08.3	55	2.7	115	5.7	175	8.6
56	7 29.0	7 30.2	7 08.5	56	2.8	116	5.7	176	8.7
57	7 29.3	7 30.5	7 08.8	57	2.8	117	5.8	177	8.7
58	7 29.5	7 30.7	7 09.0	58	2.9	118	5.8	178	8.8
59	7 29.8	7 31.0	7 09.3	59	2.9	119	5.9	179	8.8
60	7 30.0	7 31.2	7 09.5	60	3.0	120	5.9	180	8.9

30m

Sec.	SUN PLANET	♈	MOON	code	corr'n	code	corr'n	code	corr'n
	° ′	° ′	° ′		′		′		′
0	7 30.0	7 31.2	7 09.5	0	0.0	60	3.1	120	6.1
1	7 30.3	7 31.5	7 09.7	1	0.1	61	3.1	121	6.2
2	7 30.5	7 31.7	7 10.0	2	0.1	62	3.2	122	6.2
3	7 30.8	7 32.0	7 10.2	3	0.2	63	3.2	123	6.3
4	7 31.0	7 32.2	7 10.5	4	0.2	64	3.3	124	6.3
5	7 31.3	7 32.5	7 10.7	5	0.3	65	3.3	125	6.4
6	7 31.5	7 32.7	7 10.9	6	0.3	66	3.4	126	6.4
7	7 31.8	7 33.0	7 11.2	7	0.4	67	3.4	127	6.5
8	7 32.0	7 33.2	7 11.4	8	0.4	68	3.5	128	6.5
9	7 32.3	7 33.5	7 11.6	9	0.5	69	3.5	129	6.6
10	7 32.5	7 33.7	7 11.9	10	0.5	70	3.6	130	6.6
11	7 32.8	7 34.0	7 12.1	11	0.6	71	3.6	131	6.7
12	7 33.0	7 34.2	7 12.4	12	0.6	72	3.7	132	6.7
13	7 33.3	7 34.5	7 12.6	13	0.7	73	3.7	133	6.8
14	7 33.5	7 34.7	7 12.8	14	0.7	74	3.8	134	6.8
15	7 33.8	7 35.0	7 13.1	15	0.8	75	3.8	135	6.9
16	7 34.0	7 35.2	7 13.3	16	0.8	76	3.9	136	6.9
17	7 34.3	7 35.5	7 13.6	17	0.9	77	3.9	137	7.0
18	7 34.5	7 35.7	7 13.8	18	0.9	78	4.0	138	7.0
19	7 34.8	7 36.0	7 14.0	19	1.0	79	4.0	139	7.1
20	7 35.0	7 36.2	7 14.3	20	1.0	80	4.1	140	7.1
21	7 35.3	7 36.5	7 14.5	21	1.1	81	4.1	141	7.2
22	7 35.5	7 36.7	7 14.7	22	1.1	82	4.2	142	7.2
23	7 35.8	7 37.0	7 15.0	23	1.2	83	4.2	143	7.3
24	7 36.0	7 37.2	7 15.2	24	1.2	84	4.3	144	7.3
25	7 36.3	7 37.5	7 15.5	25	1.3	85	4.3	145	7.4
26	7 36.5	7 37.7	7 15.7	26	1.3	86	4.4	146	7.4
27	7 36.8	7 38.0	7 15.9	27	1.4	87	4.4	147	7.5
28	7 37.0	7 38.3	7 16.2	28	1.4	88	4.5	148	7.5
29	7 37.3	7 38.5	7 16.4	29	1.5	89	4.5	149	7.6
30	7 37.5	7 38.8	7 16.7	30	1.5	90	4.6	150	7.6
31	7 37.8	7 39.0	7 16.9	31	1.6	91	4.6	151	7.7
32	7 38.0	7 39.3	7 17.1	32	1.6	92	4.7	152	7.7
33	7 38.3	7 39.5	7 17.4	33	1.7	93	4.7	153	7.8
34	7 38.5	7 39.8	7 17.6	34	1.7	94	4.8	154	7.8
35	7 38.8	7 40.0	7 17.9	35	1.8	95	4.8	155	7.9
36	7 39.0	7 40.3	7 18.1	36	1.8	96	4.9	156	7.9
37	7 39.3	7 40.5	7 18.3	37	1.9	97	4.9	157	8.0
38	7 39.5	7 40.8	7 18.6	38	1.9	98	5.0	158	8.0
39	7 39.8	7 41.0	7 18.8	39	2.0	99	5.0	159	8.1
40	7 40.0	7 41.3	7 19.0	40	2.0	100	5.1	160	8.1
41	7 40.3	7 41.5	7 19.3	41	2.1	101	5.1	161	8.2
42	7 40.5	7 41.8	7 19.5	42	2.1	102	5.2	162	8.2
43	7 40.8	7 42.0	7 19.8	43	2.2	103	5.2	163	8.3
44	7 41.0	7 42.3	7 20.0	44	2.2	104	5.3	164	8.3
45	7 41.3	7 42.5	7 20.2	45	2.3	105	5.3	165	8.4
46	7 41.5	7 42.8	7 20.5	46	2.3	106	5.4	166	8.4
47	7 41.8	7 43.0	7 20.7	47	2.4	107	5.4	167	8.5
48	7 42.0	7 43.3	7 21.0	48	2.4	108	5.5	168	8.5
49	7 42.3	7 43.5	7 21.2	49	2.5	109	5.5	169	8.6
50	7 42.5	7 43.8	7 21.4	50	2.5	110	5.6	170	8.6
51	7 42.8	7 44.0	7 21.7	51	2.6	111	5.6	171	8.7
52	7 43.0	7 44.3	7 21.9	52	2.6	112	5.7	172	8.7
53	7 43.3	7 44.5	7 22.1	53	2.7	113	5.7	173	8.8
54	7 43.5	7 44.8	7 22.4	54	2.7	114	5.8	174	8.8
55	7 43.8	7 45.0	7 22.6	55	2.8	115	5.8	175	8.9
56	7 44.0	7 45.3	7 22.9	56	2.8	116	5.9	176	8.9
57	7 44.3	7 45.5	7 23.1	57	2.9	117	5.9	177	9.0
58	7 44.5	7 45.8	7 23.3	58	2.9	118	6.0	178	9.0
59	7 44.8	7 46.0	7 23.6	59	3.0	119	6.0	179	9.1
60	7 45.0	7 46.3	7 23.8	60	3.1	120	6.1	180	9.2

31m

Sec.	SUN PLANET	♈	MOON	code	corr'n	code	corr'n	code	corr'n
	° ′	° ′	° ′		′		′		′
0	7 45.0	7 46.3	7 23.8	0	0.0	60	3.2	120	6.3
1	7 45.3	7 46.5	7 24.1	1	0.1	61	3.2	121	6.4
2	7 45.5	7 46.8	7 24.3	2	0.1	62	3.3	122	6.4
3	7 45.8	7 47.0	7 24.5	3	0.2	63	3.3	123	6.5
4	7 46.0	7 47.3	7 24.8	4	0.2	64	3.4	124	6.5
5	7 46.3	7 47.5	7 25.0	5	0.3	65	3.4	125	6.6
6	7 46.5	7 47.8	7 25.2	6	0.3	66	3.5	126	6.6
7	7 46.8	7 48.0	7 25.5	7	0.4	67	3.5	127	6.7
8	7 47.0	7 48.3	7 25.7	8	0.4	68	3.6	128	6.7
9	7 47.3	7 48.5	7 26.0	9	0.5	69	3.6	129	6.8
10	7 47.5	7 48.8	7 26.2	10	0.5	70	3.7	130	6.8
11	7 47.8	7 49.0	7 26.4	11	0.6	71	3.7	131	6.9
12	7 48.0	7 49.3	7 26.7	12	0.6	72	3.8	132	6.9
13	7 48.3	7 49.5	7 26.9	13	0.7	73	3.8	133	7.0
14	7 48.5	7 49.8	7 27.2	14	0.7	74	3.9	134	7.0
15	7 48.8	7 50.0	7 27.4	15	0.8	75	3.9	135	7.1
16	7 49.0	7 50.3	7 27.6	16	0.8	76	4.0	136	7.1
17	7 49.3	7 50.5	7 27.9	17	0.9	77	4.0	137	7.2
18	7 49.5	7 50.8	7 28.1	18	0.9	78	4.1	138	7.2
19	7 49.8	7 51.0	7 28.4	19	1.0	79	4.1	139	7.3
20	7 50.0	7 51.3	7 28.6	20	1.1	80	4.2	140	7.4
21	7 50.3	7 51.5	7 28.8	21	1.1	81	4.3	141	7.4
22	7 50.5	7 51.8	7 29.1	22	1.2	82	4.3	142	7.5
23	7 50.8	7 52.0	7 29.3	23	1.2	83	4.4	143	7.5
24	7 51.0	7 52.3	7 29.5	24	1.3	84	4.4	144	7.6
25	7 51.3	7 52.5	7 29.8	25	1.3	85	4.5	145	7.6
26	7 51.5	7 52.8	7 30.0	26	1.4	86	4.5	146	7.7
27	7 51.8	7 53.0	7 30.3	27	1.4	87	4.6	147	7.7
28	7 52.0	7 53.3	7 30.5	28	1.5	88	4.6	148	7.8
29	7 52.3	7 53.5	7 30.7	29	1.5	89	4.7	149	7.8
30	7 52.5	7 53.8	7 31.0	30	1.6	90	4.7	150	7.9
31	7 52.8	7 54.0	7 31.2	31	1.6	91	4.8	151	7.9
32	7 53.0	7 54.3	7 31.5	32	1.7	92	4.8	152	8.0
33	7 53.3	7 54.5	7 31.7	33	1.7	93	4.9	153	8.0
34	7 53.5	7 54.8	7 31.9	34	1.8	94	4.9	154	8.1
35	7 53.8	7 55.0	7 32.2	35	1.8	95	5.0	155	8.1
36	7 54.0	7 55.3	7 32.4	36	1.9	96	5.0	156	8.2
37	7 54.3	7 55.5	7 32.6	37	1.9	97	5.1	157	8.2
38	7 54.5	7 55.8	7 32.9	38	2.0	98	5.1	158	8.3
39	7 54.8	7 56.0	7 33.1	39	2.0	99	5.2	159	8.3
40	7 55.0	7 56.3	7 33.4	40	2.1	100	5.3	160	8.4
41	7 55.3	7 56.6	7 33.6	41	2.2	101	5.3	161	8.5
42	7 55.5	7 56.8	7 33.8	42	2.2	102	5.4	162	8.5
43	7 55.8	7 57.1	7 34.1	43	2.3	103	5.4	163	8.6
44	7 56.0	7 57.3	7 34.3	44	2.3	104	5.5	164	8.6
45	7 56.3	7 57.6	7 34.6	45	2.4	105	5.5	165	8.7
46	7 56.5	7 57.8	7 34.8	46	2.4	106	5.6	166	8.7
47	7 56.8	7 58.1	7 35.0	47	2.5	107	5.6	167	8.8
48	7 57.0	7 58.3	7 35.3	48	2.5	108	5.7	168	8.8
49	7 57.3	7 58.6	7 35.5	49	2.6	109	5.7	169	8.9
50	7 57.5	7 58.8	7 35.7	50	2.6	110	5.8	170	8.9
51	7 57.8	7 59.1	7 36.0	51	2.7	111	5.8	171	9.0
52	7 58.0	7 59.3	7 36.2	52	2.7	112	5.9	172	9.0
53	7 58.3	7 59.6	7 36.5	53	2.8	113	5.9	173	9.1
54	7 58.5	7 59.8	7 36.7	54	2.8	114	6.0	174	9.1
55	7 58.8	8 00.1	7 36.9	55	2.9	115	6.0	175	9.2
56	7 59.0	8 00.3	7 37.2	56	2.9	116	6.1	176	9.2
57	7 59.3	8 00.6	7 37.4	57	3.0	117	6.1	177	9.3
58	7 59.5	8 00.8	7 37.7	58	3.0	118	6.2	178	9.3
59	7 59.8	8 01.1	7 37.9	59	3.1	119	6.2	179	9.4
60	8 00.0	8 01.3	7 38.1	60	3.2	120	6.3	180	9.5

833190°—50——18

32m

Sec.	SUN PLANET	♈	MOON	code	corr'n	code	corr'n	code	corr'n
	° ′	° ′	° ′		′		′		′
0	8 00.0	8 01.3	7 38.1	0	0.0	60	3.3	120	6.5
1	8 00.3	8 01.6	7 38.4	1	0.1	61	3.3	121	6.6
2	8 00.5	8 01.8	7 38.6	2	0.1	62	3.4	122	6.6
3	8 00.8	8 02.1	7 38.8	3	0.2	63	3.4	123	6.7
4	8 01.0	8 02.3	7 39.1	4	0.2	64	3.5	124	6.7
5	8 01.3	8 02.6	7 39.3	5	0.3	65	3.5	125	6.8
6	8 01.5	8 02.8	7 39.6	6	0.3	66	3.6	126	6.8
7	8 01.8	8 03.1	7 39.8	7	0.4	67	3.6	127	6.9
8	8 02.0	8 03.3	7 40.0	8	0.4	68	3.7	128	6.9
9	8 02.3	8 03.6	7 40.3	9	0.5	69	3.7	129	7.0
10	8 02.5	8 03.8	7 40.5	10	0.5	70	3.8	130	7.0
11	8 02.8	8 04.1	7 40.8	11	0.6	71	3.8	131	7.1
12	8 03.0	8 04.3	7 41.0	12	0.7	72	3.9	132	7.2
13	8 03.3	8 04.6	7 41.2	13	0.7	73	4.0	133	7.2
14	8 03.5	8 04.8	7 41.5	14	0.8	74	4.0	134	7.3
15	8 03.8	8 05.1	7 41.7	15	0.8	75	4.1	135	7.3
16	8 04.0	8 05.3	7 42.0	16	0.9	76	4.1	136	7.4
17	8 04.3	8 05.6	7 42.2	17	0.9	77	4.2	137	7.4
18	8 04.5	8 05.8	7 42.4	18	1.0	78	4.2	138	7.5
19	8 04.8	8 06.1	7 42.7	19	1.0	79	4.3	139	7.5
20	8 05.0	8 06.3	7 42.9	20	1.1	80	4.3	140	7.6
21	8 05.3	8 06.6	7 43.1	21	1.1	81	4.4	141	7.6
22	8 05.5	8 06.8	7 43.4	22	1.2	82	4.4	142	7.7
23	8 05.8	8 07.1	7 43.6	23	1.2	83	4.5	143	7.7
24	8 06.0	8 07.3	7 43.9	24	1.3	84	4.6	144	7.8
25	8 06.3	8 07.6	7 44.1	25	1.4	85	4.6	145	7.9
26	8 06.5	8 07.8	7 44.3	26	1.4	86	4.7	146	7.9
27	8 06.8	8 08.1	7 44.6	27	1.5	87	4.7	147	8.0
28	8 07.0	8 08.3	7 44.8	28	1.5	88	4.8	148	8.0
29	8 07.3	8 08.6	7 45.1	29	1.6	89	4.8	149	8.1
30	8 07.5	8 08.8	7 45.3	30	1.6	90	4.9	150	8.1
31	8 07.8	8 09.1	7 45.5	31	1.7	91	4.9	151	8.2
32	8 08.0	8 09.3	7 45.8	32	1.7	92	5.0	152	8.2
33	8 08.3	8 09.6	7 46.0	33	1.8	93	5.0	153	8.3
34	8 08.5	8 09.8	7 46.2	34	1.8	94	5.1	154	8.3
35	8 08.8	8 10.1	7 46.5	35	1.9	95	5.1	155	8.4
36	8 09.0	8 10.3	7 46.7	36	2.0	96	5.2	156	8.5
37	8 09.3	8 10.6	7 47.0	37	2.0	97	5.3	157	8.5
38	8 09.5	8 10.8	7 47.2	38	2.1	98	5.3	158	8.6
39	8 09.8	8 11.1	7 47.4	39	2.1	99	5.4	159	8.6
40	8 10.0	8 11.3	7 47.7	40	2.2	100	5.4	160	8.7
41	8 10.3	8 11.6	7 47.9	41	2.2	101	5.5	161	8.7
42	8 10.5	8 11.8	7 48.2	42	2.3	102	5.5	162	8.8
43	8 10.8	8 12.1	7 48.4	43	2.3	103	5.6	163	8.8
44	8 11.0	8 12.3	7 48.6	44	2.4	104	5.6	164	8.9
45	8 11.3	8 12.6	7 48.9	45	2.4	105	5.7	165	8.9
46	8 11.5	8 12.8	7 49.1	46	2.5	106	5.7	166	9.0
47	8 11.8	8 13.1	7 49.3	47	2.5	107	5.8	167	9.0
48	8 12.0	8 13.3	7 49.6	48	2.6	108	5.9	168	9.1
49	8 12.3	8 13.6	7 49.8	49	2.7	109	5.9	169	9.2
50	8 12.5	8 13.8	7 50.1	50	2.7	110	6.0	170	9.2
51	8 12.8	8 14.1	7 50.3	51	2.8	111	6.0	171	9.3
52	8 13.0	8 14.3	7 50.5	52	2.8	112	6.1	172	9.3
53	8 13.3	8 14.6	7 50.8	53	2.9	113	6.1	173	9.4
54	8 13.5	8 14.9	7 51.0	54	2.9	114	6.2	174	9.4
55	8 13.8	8 15.1	7 51.3	55	3.0	115	6.2	175	9.5
56	8 14.0	8 15.4	7 51.5	56	3.0	116	6.3	176	9.5
57	8 14.3	8 15.6	7 51.7	57	3.1	117	6.3	177	9.6
58	8 14.5	8 15.9	7 52.0	58	3.1	118	6.4	178	9.6
59	8 14.8	8 16.1	7 52.2	59	3.2	119	6.4	179	9.7
60	8 15.0	8 16.4	7 52.5	60	3.3	120	6.5	180	9.8

33m

Sec.	SUN PLANET	♈	MOON	code	corr'n	code	corr'n	code	corr'n
	° ′	° ′	° ′		′		′		′
0	8 15.0	8 16.4	7 52.5	0	0.0	60	3.4	120	6.7
1	8 15.3	8 16.6	7 52.7	1	0.1	61	3.4	121	6.8
2	8 15.5	8 16.9	7 52.9	2	0.1	62	3.5	122	6.8
3	8 15.8	8 17.1	7 53.2	3	0.2	63	3.5	123	6.9
4	8 16.0	8 17.4	7 53.4	4	0.2	64	3.6	124	6.9
5	8 16.3	8 17.6	7 53.6	5	0.3	65	3.6	125	7.0
6	8 16.5	8 17.9	7 53.9	6	0.3	66	3.7	126	7.0
7	8 16.8	8 18.1	7 54.1	7	0.4	67	3.7	127	7.1
8	8 17.0	8 18.4	7 54.4	8	0.4	68	3.8	128	7.1
9	8 17.3	8 18.6	7 54.6	9	0.5	69	3.9	129	7.2
10	8 17.5	8 18.9	7 54.8	10	0.6	70	3.9	130	7.3
11	8 17.8	8 19.1	7 55.1	11	0.6	71	4.0	131	7.3
12	8 18.0	8 19.4	7 55.3	12	0.7	72	4.0	132	7.4
13	8 18.3	8 19.6	7 55.6	13	0.7	73	4.1	133	7.4
14	8 18.5	8 19.9	7 55.8	14	0.8	74	4.1	134	7.5
15	8 18.8	8 20.1	7 56.0	15	0.8	75	4.2	135	7.5
16	8 19.0	8 20.4	7 56.3	16	0.9	76	4.2	136	7.6
17	8 19.3	8 20.6	7 56.5	17	0.9	77	4.3	137	7.6
18	8 19.5	8 20.9	7 56.7	18	1.0	78	4.4	138	7.7
19	8 19.8	8 21.1	7 57.0	19	1.1	79	4.4	139	7.8
20	8 20.0	8 21.4	7 57.2	20	1.1	80	4.5	140	7.8
21	8 20.3	8 21.6	7 57.5	21	1.2	81	4.5	141	7.9
22	8 20.5	8 21.9	7 57.7	22	1.2	82	4.6	142	7.9
23	8 20.8	8 22.1	7 57.9	23	1.3	83	4.6	143	8.0
24	8 21.0	8 22.4	7 58.2	24	1.3	84	4.7	144	8.0
25	8 21.3	8 22.6	7 58.4	25	1.4	85	4.7	145	8.1
26	8 21.5	8 22.9	7 58.7	26	1.5	86	4.8	146	8.2
27	8 21.8	8 23.1	7 58.9	27	1.5	87	4.9	147	8.2
28	8 22.0	8 23.4	7 59.1	28	1.6	88	4.9	148	8.3
29	8 22.3	8 23.6	7 59.4	29	1.6	89	5.0	149	8.3
30	8 22.5	8 23.9	7 59.6	30	1.7	90	5.0	150	8.4
31	8 22.8	8 24.1	7 59.8	31	1.7	91	5.1	151	8.4
32	8 23.0	8 24.4	8 00.1	32	1.8	92	5.1	152	8.5
33	8 23.3	8 24.6	8 00.3	33	1.8	93	5.2	153	8.5
34	8 23.5	8 24.9	8 00.6	34	1.9	94	5.2	154	8.6
35	8 23.8	8 25.1	8 00.8	35	2.0	95	5.3	155	8.7
36	8 24.0	8 25.4	8 01.0	36	2.0	96	5.4	156	8.7
37	8 24.3	8 25.6	8 01.3	37	2.1	97	5.4	157	8.8
38	8 24.5	8 25.9	8 01.5	38	2.1	98	5.5	158	8.8
39	8 24.8	8 26.1	8 01.8	39	2.2	99	5.5	159	8.9
40	8 25.0	8 26.4	8 02.0	40	2.2	100	5.6	160	8.9
41	8 25.3	8 26.6	8 02.2	41	2.3	101	5.6	161	9.0
42	8 25.5	8 26.9	8 02.5	42	2.3	102	5.7	162	9.0
43	8 25.8	8 27.1	8 02.7	43	2.4	103	5.8	163	9.1
44	8 26.0	8 27.4	8 02.9	44	2.5	104	5.8	164	9.2
45	8 26.3	8 27.6	8 03.2	45	2.5	105	5.9	165	9.2
46	8 26.5	8 27.9	8 03.4	46	2.6	106	5.9	166	9.3
47	8 26.8	8 28.1	8 03.7	47	2.6	107	6.0	167	9.3
48	8 27.0	8 28.4	8 03.9	48	2.7	108	6.0	168	9.4
49	8 27.3	8 28.6	8 04.1	49	2.7	109	6.1	169	9.4
50	8 27.5	8 28.9	8 04.4	50	2.8	110	6.1	170	9.5
51	8 27.8	8 29.1	8 04.6	51	2.8	111	6.2	171	9.5
52	8 28.0	8 29.4	8 04.9	52	2.9	112	6.3	172	9.6
53	8 28.3	8 29.6	8 05.1	53	3.0	113	6.3	173	9.7
54	8 28.5	8 29.9	8 05.3	54	3.0	114	6.4	174	9.7
55	8 28.8	8 30.1	8 05.6	55	3.1	115	6.4	175	9.8
56	8 29.0	8 30.4	8 05.8	56	3.1	116	6.5	176	9.8
57	8 29.3	8 30.6	8 06.1	57	3.2	117	6.5	177	9.9
58	8 29.5	8 30.9	8 06.3	58	3.2	118	6.6	178	9.9
59	8 29.8	8 31.1	8 06.5	59	3.3	119	6.6	179	10.0
60	8 30.0	8 31.4	8 06.8	60	3.4	120	6.7	180	10.1

34^m

Sec.	SUN PLANET	♈	MOON	code	corr'n	code	corr'n	code	corr'n
	° ′	° ′	° ′		′		′		′
0	8 30.0	8 31.4	8 06.8	0	0.0	60	3.5	120	6.9
1	8 30.3	8 31.6	8 07.0	1	0.1	61	3.5	121	7.0
2	8 30.5	8 31.9	8 07.2	2	0.1	62	3.6	122	7.0
3	8 30.8	8 32.1	8 07.5	3	0.2	63	3.6	123	7.1
4	8 31.0	8 32.4	8 07.7	4	0.2	64	3.7	124	7.1
5	8 31.3	8 32.6	8 08.0	5	0.3	65	3.7	125	7.2
6	8 31.5	8 32.9	8 08.2	6	0.3	66	3.8	126	7.2
7	8 31.8	8 33.2	8 08.4	7	0.4	67	3.9	127	7.3
8	8 32.0	8 33.4	8 08.7	8	0.5	68	3.9	128	7.4
9	8 32.3	8 33.7	8 08.9	9	0.5	69	4.0	129	7.4
10	8 32.5	8 33.9	8 09.2	10	0.6	70	4.0	130	7.5
11	8 32.8	8 34.2	8 09.4	11	0.6	71	4.1	131	7.5
12	8 33.0	8 34.4	8 09.6	12	0.7	72	4.1	132	7.6
13	8 33.3	8 34.7	8 09.9	13	0.7	73	4.2	133	7.6
14	8 33.5	8 34.9	8 10.1	14	0.8	74	4.3	134	7.7
15	8 33.8	8 35.2	8 10.3	15	0.9	75	4.3	135	7.8
16	8 34.0	8 35.4	8 10.6	16	0.9	76	4.4	136	7.8
17	8 34.3	8 35.7	8 10.8	17	1.0	77	4.4	137	7.9
18	8 34.5	8 35.9	8 11.1	18	1.0	78	4.5	138	7.9
19	8 34.8	8 36.2	8 11.3	19	1.1	79	4.5	139	8.0
20	8 35.0	8 36.4	8 11.5	20	1.2	80	4.6	140	8.1
21	8 35.3	8 36.7	8 11.8	21	1.2	81	4.7	141	8.1
22	8 35.5	8 36.9	8 12.0	22	1.3	82	4.7	142	8.2
23	8 35.8	8 37.2	8 12.3	23	1.3	83	4.8	143	8.2
24	8 36.0	8 37.4	8 12.5	24	1.4	84	4.8	144	8.3
25	8 36.3	8 37.7	8 12.7	25	1.4	85	4.9	145	8.3
26	8 36.5	8 37.9	8 13.0	26	1.5	86	4.9	146	8.4
27	8 36.8	8 38.2	8 13.2	27	1.6	87	5.0	147	8.5
28	8 37.0	8 38.4	8 13.4	28	1.6	88	5.1	148	8.5
29	8 37.3	8 38.7	8 13.7	29	1.7	89	5.1	149	8.6
30	8 37.5	8 38.9	8 13.9	30	1.7	90	5.2	150	8.6
31	8 37.8	8 39.2	8 14.2	31	1.8	91	5.2	151	8.7
32	8 38.0	8 39.4	8 14.4	32	1.8	92	5.3	152	8.7
33	8 38.3	8 39.7	8 14.6	33	1.9	93	5.3	153	8.8
34	8 38.5	8 39.9	8 14.9	34	2.0	94	5.4	154	8.9
35	8 38.8	8 40.2	8 15.1	35	2.0	95	5.5	155	8.9
36	8 39.0	8 40.4	8 15.4	36	2.1	96	5.5	156	9.0
37	8 39.3	8 40.7	8 15.6	37	2.1	97	5.6	157	9.0
38	8 39.5	8 40.9	8 15.8	38	2.2	98	5.6	158	9.1
39	8 39.8	8 41.2	8 16.1	39	2.2	99	5.7	159	9.1
40	8 40.0	8 41.4	8 16.3	40	2.3	100	5.8	160	9.2
41	8 40.3	8 41.7	8 16.5	41	2.4	101	5.8	161	9.3
42	8 40.5	8 41.9	8 16.8	42	2.4	102	5.9	162	9.3
43	8 40.8	8 42.2	8 17.0	43	2.5	103	5.9	163	9.4
44	8 41.0	8 42.4	8 17.3	44	2.5	104	6.0	164	9.4
45	8 41.3	8 42.7	8 17.5	45	2.6	105	6.0	165	9.5
46	8 41.5	8 42.9	8 17.7	46	2.6	106	6.1	166	9.5
47	8 41.8	8 43.2	8 18.0	47	2.7	107	6.2	167	9.6
48	8 42.0	8 43.4	8 18.2	48	2.8	108	6.2	168	9.7
49	8 42.3	8 43.7	8 18.5	49	2.8	109	6.3	169	9.7
50	8 42.5	8 43.9	8 18.7	50	2.9	110	6.3	170	9.8
51	8 42.8	8 44.2	8 18.9	51	2.9	111	6.4	171	9.8
52	8 43.0	8 44.4	8 19.2	52	3.0	112	6.4	172	9.9
53	8 43.3	8 44.7	8 19.4	53	3.0	113	6.5	173	9.9
54	8 43.5	8 44.9	8 19.7	54	3.1	114	6.6	174	10.0
55	8 43.8	8 45.2	8 19.9	55	3.2	115	6.6	175	10.1
56	8 44.0	8 45.4	8 20.1	56	3.2	116	6.7	176	10.1
57	8 44.3	8 45.7	8 20.4	57	3.3	117	6.7	177	10.2
58	8 44.5	8 45.9	8 20.6	58	3.3	118	6.8	178	10.2
59	8 44.8	8 46.2	8 20.8	59	3.4	119	6.8	179	10.3
60	8 45.0	8 46.4	8 21.1	60	3.5	120	6.9	180	10.4

35^m

Sec.	SUN PLANET	♈	MOON	code	corr'n	code	corr'n	code	corr'n
	° ′	° ′	° ′		′		′		′
0	8 45.0	8 46.4	8 21.1	0	0.0	60	3.6	120	7.1
1	8 45.3	8 46.7	8 21.3	1	0.1	61	3.6	121	7.2
2	8 45.5	8 46.9	8 21.6	2	0.1	62	3.7	122	7.2
3	8 45.8	8 47.2	8 21.8	3	0.2	63	3.7	123	7.3
4	8 46.0	8 47.4	8 22.0	4	0.2	64	3.8	124	7.3
5	8 46.3	8 47.7	8 22.3	5	0.3	65	3.8	125	7.4
6	8 46.5	8 47.9	8 22.5	6	0.4	66	3.9	126	7.5
7	8 46.8	8 48.2	8 22.8	7	0.4	67	4.0	127	7.5
8	8 47.0	8 48.4	8 23.0	8	0.5	68	4.0	128	7.6
9	8 47.3	8 48.7	8 23.2	9	0.5	69	4.1	129	7.6
10	8 47.5	8 48.9	8 23.5	10	0.6	70	4.1	130	7.7
11	8 47.8	8 49.2	8 23.7	11	0.7	71	4.2	131	7.8
12	8 48.0	8 49.4	8 23.9	12	0.7	72	4.3	132	7.8
13	8 48.3	8 49.7	8 24.2	13	0.8	73	4.3	133	7.9
14	8 48.5	8 49.9	8 24.4	14	0.8	74	4.4	134	7.9
15	8 48.8	8 50.2	8 24.7	15	0.9	75	4.4	135	8.0
16	8 49.0	8 50.4	8 24.9	16	0.9	76	4.5	136	8.0
17	8 49.3	8 50.7	8 25.1	17	1.0	77	4.6	137	8.1
18	8 49.5	8 50.9	8 25.4	18	1.1	78	4.6	138	8.2
19	8 49.8	8 51.2	8 25.6	19	1.1	79	4.7	139	8.2
20	8 50.0	8 51.5	8 25.9	20	1.2	80	4.7	140	8.3
21	8 50.3	8 51.7	8 26.1	21	1.2	81	4.8	141	8.3
22	8 50.5	8 52.0	8 26.3	22	1.3	82	4.9	142	8.4
23	8 50.8	8 52.2	8 26.6	23	1.4	83	4.9	143	8.5
24	8 51.0	8 52.5	8 26.8	24	1.4	84	5.0	144	8.5
25	8 51.3	8 52.7	8 27.0	25	1.5	85	5.0	145	8.6
26	8 51.5	8 53.0	8 27.3	26	1.5	86	5.1	146	8.6
27	8 51.8	8 53.2	8 27.5	27	1.6	87	5.1	147	8.7
28	8 52.0	8 53.5	8 27.8	28	1.7	88	5.2	148	8.8
29	8 52.3	8 53.7	8 28.0	29	1.7	89	5.3	149	8.8
30	8 52.5	8 54.0	8 28.2	30	1.8	90	5.3	150	8.9
31	8 52.8	8 54.2	8 28.5	31	1.8	91	5.4	151	8.9
32	8 53.0	8 54.5	8 28.7	32	1.9	92	5.4	152	9.0
33	8 53.3	8 54.7	8 29.0	33	2.0	93	5.5	153	9.1
34	8 53.5	8 55.0	8 29.2	34	2.0	94	5.6	154	9.1
35	8 53.8	8 55.2	8 29.4	35	2.1	95	5.6	155	9.2
36	8 54.0	8 55.5	8 29.7	36	2.1	96	5.7	156	9.2
37	8 54.3	8 55.7	8 29.9	37	2.2	97	5.7	157	9.3
38	8 54.5	8 56.0	8 30.2	38	2.2	98	5.8	158	9.3
39	8 54.8	8 56.2	8 30.4	39	2.3	99	5.9	159	9.4
40	8 55.0	8 56.5	8 30.6	40	2.4	100	5.9	160	9.5
41	8 55.3	8 56.7	8 30.9	41	2.4	101	6.0	161	9.5
42	8 55.5	8 57.0	8 31.1	42	2.5	102	6.0	162	9.6
43	8 55.8	8 57.2	8 31.3	43	2.5	103	6.1	163	9.6
44	8 56.0	8 57.5	8 31.6	44	2.6	104	6.2	164	9.7
45	8 56.3	8 57.7	8 31.8	45	2.7	105	6.2	165	9.8
46	8 56.5	8 58.0	8 32.1	46	2.7	106	6.3	166	9.8
47	8 56.8	8 58.2	8 32.3	47	2.8	107	6.3	167	9.9
48	8 57.0	8 58.5	8 32.5	48	2.8	108	6.4	168	9.9
49	8 57.3	8 58.7	8 32.8	49	2.9	109	6.4	169	10.0
50	8 57.5	8 59.0	8 33.0	50	3.0	110	6.5	170	10.1
51	8 57.8	8 59.2	8 33.3	51	3.0	111	6.6	171	10.1
52	8 58.0	8 59.5	8 33.5	52	3.1	112	6.6	172	10.2
53	8 58.3	8 59.7	8 33.7	53	3.1	113	6.7	173	10.2
54	8 58.5	9 00.0	8 34.0	54	3.2	114	6.7	174	10.3
55	8 58.8	9 00.2	8 34.2	55	3.3	115	6.8	175	10.4
56	8 59.0	9 00.5	8 34.4	56	3.3	116	6.9	176	10.4
57	8 59.3	9 00.7	8 34.7	57	3.4	117	6.9	177	10.5
58	8 59.5	9 01.0	8 34.9	58	3.4	118	7.0	178	10.5
59	8 59.8	9 01.2	8 35.2	59	3.5	119	7.0	179	10.6
60	9 00.0	9 01.5	8 35.4	60	3.6	120	7.1	180	10.7

36ᵐ

Sec.	SUN PLANET ° ′	♈ ° ′	MOON ° ′	code	corr'n ′	code	corr'n ′	code	corr'n ′
0	9 00.0	9 01.5	8 35.4	0	0.0	60	3.7	120	7.3
1	9 00.3	9 01.7	8 35.6	1	0.1	61	3.7	121	7.4
2	9 00.5	9 02.0	8 35.9	2	0.1	62	3.8	122	7.4
3	9 00.8	9 02.2	8 36.1	3	0.2	63	3.8	123	7.5
4	9 01.0	9 02.5	8 36.4	4	0.2	64	3.9	124	7.5
5	9 01.3	9 02.7	8 36.6	5	0.3	65	4.0	125	7.6
6	9 01.5	9 03.0	8 36.8	6	0.4	66	4.0	126	7.7
7	9 01.8	9 03.2	8 37.1	7	0.4	67	4.1	127	7.7
8	9 02.0	9 03.5	8 37.3	8	0.5	68	4.1	128	7.8
9	9 02.3	9 03.7	8 37.5	9	0.5	69	4.2	129	7.8
10	9 02.5	9 04.0	8 37.8	10	0.6	70	4.3	130	7.9
11	9 02.8	9 04.2	8 38.0	11	0.7	71	4.3	131	8.0
12	9 03.0	9 04.5	8 38.3	12	0.7	72	4.4	132	8.0
13	9 03.3	9 04.7	8 38.5	13	0.8	73	4.4	133	8.1
14	9 03.5	9 05.0	8 38.7	14	0.9	74	4.5	134	8.2
15	9 03.8	9 05.2	8 39.0	15	0.9	75	4.6	135	8.2
16	9 04.0	9 05.5	8 39.2	16	1.0	76	4.6	136	8.3
17	9 04.3	9 05.7	8 39.5	17	1.0	77	4.7	137	8.3
18	9 04.5	9 06.0	8 39.7	18	1.1	78	4.7	138	8.4
19	9 04.8	9 06.2	8 39.9	19	1.2	79	4.8	139	8.5
20	9 05.0	9 06.5	8 40.2	20	1.2	80	4.9	140	8.5
21	9 05.3	9 06.7	8 40.4	21	1.3	81	4.9	141	8.6
22	9 05.5	9 07.0	8 40.6	22	1.3	82	5.0	142	8.6
23	9 05.8	9 07.2	8 40.9	23	1.4	83	5.0	143	8.7
24	9 06.0	9 07.5	8 41.1	24	1.5	84	5.1	144	8.8
25	9 06.3	9 07.7	8 41.4	25	1.5	85	5.2	145	8.8
26	9 06.5	9 08.0	8 41.6	26	1.6	86	5.2	146	8.9
27	9 06.8	9 08.2	8 41.8	27	1.6	87	5.3	147	8.9
28	9 07.0	9 08.5	8 42.1	28	1.7	88	5.4	148	9.0
29	9 07.3	9 08.7	8 42.3	29	1.8	89	5.4	149	9.1
30	9 07.5	9 09.0	8 42.6	30	1.8	90	5.5	150	9.1
31	9 07.8	9 09.2	8 42.8	31	1.9	91	5.5	151	9.2
32	9 08.0	9 09.5	8 43.0	32	1.9	92	5.6	152	9.2
33	9 08.3	9 09.8	8 43.3	33	2.0	93	5.7	153	9.3
34	9 08.5	9 10.0	8 43.5	34	2.1	94	5.7	154	9.4
35	9 08.8	9 10.3	8 43.8	35	2.1	95	5.8	155	9.4
36	9 09.0	9 10.5	8 44.0	36	2.2	96	5.8	156	9.5
37	9 09.3	9 10.8	8 44.2	37	2.3	97	5.9	157	9.6
38	9 09.5	9 11.0	8 44.5	38	2.3	98	6.0	158	9.6
39	9 09.8	9 11.3	8 44.7	39	2.4	99	6.0	159	9.7
40	9 10.0	9 11.5	8 44.9	40	2.4	100	6.1	160	9.7
41	9 10.3	9 11.8	8 45.2	41	2.5	101	6.1	161	9.8
42	9 10.5	9 12.0	8 45.4	42	2.6	102	6.2	162	9.9
43	9 10.8	9 12.3	8 45.7	43	2.6	103	6.3	163	9.9
44	9 11.0	9 12.5	8 45.9	44	2.7	104	6.3	164	10.0
45	9 11.3	9 12.8	8 46.1	45	2.7	105	6.4	165	10.0
46	9 11.5	9 13.0	8 46.4	46	2.8	106	6.4	166	10.1
47	9 11.8	9 13.3	8 46.6	47	2.9	107	6.5	167	10.2
48	9 12.0	9 13.5	8 46.9	48	2.9	108	6.6	168	10.2
49	9 12.3	9 13.8	8 47.1	49	3.0	109	6.6	169	10.3
50	9 12.5	9 14.0	8 47.3	50	3.0	110	6.7	170	10.3
51	9 12.8	9 14.3	8 47.6	51	3.1	111	6.8	171	10.4
52	9 13.0	9 14.5	8 47.8	52	3.2	112	6.8	172	10.5
53	9 13.3	9 14.8	8 48.0	53	3.2	113	6.9	173	10.5
54	9 13.5	9 15.0	8 48.3	54	3.3	114	6.9	174	10.6
55	9 13.8	9 15.3	8 48.5	55	3.3	115	7.0	175	10.6
56	9 14.0	9 15.5	8 48.8	56	3.4	116	7.1	176	10.7
57	9 14.3	9 15.8	8 49.0	57	3.5	117	7.1	177	10.8
58	9 14.5	9 16.0	8 49.2	58	3.5	118	7.2	178	10.8
59	9 14.8	9 16.3	8 49.5	59	3.6	119	7.2	179	10.9
60	9 15.0	9 16.5	8 49.7	60	3.7	120	7.3	180	11.0

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Sec.	SUN PLANET ° ′	♈ ° ′	MOON ° ′	code	corr'n ′	code	corr'n ′	code	corr'n ′
0	9 15.0	9 16.5	8 49.7	0	0.0	60	3.8	120	7.5
1	9 15.3	9 16.8	8 50.0	1	0.1	61	3.8	121	7.6
2	9 15.5	9 17.0	8 50.2	2	0.1	62	3.9	122	7.6
3	9 15.8	9 17.3	8 50.4	3	0.2	63	3.9	123	7.7
4	9 16.0	9 17.5	8 50.7	4	0.3	64	4.0	124	7.8
5	9 16.3	9 17.8	8 50.9	5	0.3	65	4.1	125	7.8
6	9 16.5	9 18.0	8 51.1	6	0.4	66	4.1	126	7.9
7	9 16.8	9 18.3	8 51.4	7	0.4	67	4.2	127	7.9
8	9 17.0	9 18.5	8 51.6	8	0.5	68	4.3	128	8.0
9	9 17.3	9 18.8	8 51.9	9	0.6	69	4.3	129	8.1
10	9 17.5	9 19.0	8 52.1	10	0.6	70	4.4	130	8.1
11	9 17.8	9 19.3	8 52.3	11	0.7	71	4.4	131	8.2
12	9 18.0	9 19.5	8 52.6	12	0.8	72	4.5	132	8.3
13	9 18.3	9 19.8	8 52.8	13	0.8	73	4.6	133	8.3
14	9 18.5	9 20.0	8 53.1	14	0.9	74	4.6	134	8.4
15	9 18.8	9 20.3	8 53.3	15	0.9	75	4.7	135	8.4
16	9 19.0	9 20.5	8 53.5	16	1.0	76	4.8	136	8.5
17	9 19.3	9 20.8	8 53.8	17	1.1	77	4.8	137	8.6
18	9 19.5	9 21.0	8 54.0	18	1.1	78	4.9	138	8.6
19	9 19.8	9 21.3	8 54.3	19	1.2	79	4.9	139	8.7
20	9 20.0	9 21.5	8 54.5	20	1.3	80	5.0	140	8.8
21	9 20.3	9 21.8	8 54.7	21	1.3	81	5.1	141	8.8
22	9 20.5	9 22.0	8 55.0	22	1.4	82	5.1	142	8.9
23	9 20.8	9 22.3	8 55.2	23	1.4	83	5.2	143	8.9
24	9 21.0	9 22.5	8 55.4	24	1.5	84	5.3	144	9.0
25	9 21.3	9 22.8	8 55.7	25	1.6	85	5.3	145	9.1
26	9 21.5	9 23.0	8 55.9	26	1.6	86	5.4	146	9.1
27	9 21.8	9 23.3	8 56.2	27	1.7	87	5.4	147	9.2
28	9 22.0	9 23.5	8 56.4	28	1.8	88	5.5	148	9.3
29	9 22.3	9 23.8	8 56.6	29	1.8	89	5.6	149	9.3
30	9 22.5	9 24.0	8 56.9	30	1.9	90	5.6	150	9.4
31	9 22.8	9 24.3	8 57.1	31	1.9	91	5.7	151	9.4
32	9 23.0	9 24.5	8 57.4	32	2.0	92	5.8	152	9.5
33	9 23.3	9 24.8	8 57.6	33	2.1	93	5.8	153	9.6
34	9 23.5	9 25.0	8 57.8	34	2.1	94	5.9	154	9.6
35	9 23.8	9 25.3	8 58.1	35	2.2	95	5.9	155	9.7
36	9 24.0	9 25.5	8 58.3	36	2.3	96	6.0	156	9.8
37	9 24.3	9 25.8	8 58.5	37	2.3	97	6.1	157	9.8
38	9 24.5	9 26.0	8 58.8	38	2.4	98	6.1	158	9.9
39	9 24.8	9 26.3	8 59.0	39	2.4	99	6.2	159	9.9
40	9 25.0	9 26.5	8 59.3	40	2.5	100	6.3	160	10.0
41	9 25.3	9 26.8	8 59.5	41	2.6	101	6.3	161	10.1
42	9 25.5	9 27.0	8 59.7	42	2.6	102	6.4	162	10.1
43	9 25.8	9 27.3	9 00.0	43	2.7	103	6.4	163	10.2
44	9 26.0	9 27.5	9 00.2	44	2.8	104	6.5	164	10.3
45	9 26.3	9 27.8	9 00.5	45	2.8	105	6.6	165	10.3
46	9 26.5	9 28.1	9 00.7	46	2.9	106	6.6	166	10.4
47	9 26.8	9 28.3	9 00.9	47	2.9	107	6.7	167	10.4
48	9 27.0	9 28.6	9 01.2	48	3.0	108	6.8	168	10.5
49	9 27.3	9 28.8	9 01.4	49	3.1	109	6.8	169	10.6
50	9 27.5	9 29.1	9 01.6	50	3.1	110	6.9	170	10.6
51	9 27.8	9 29.3	9 01.9	51	3.2	111	6.9	171	10.7
52	9 28.0	9 29.6	9 02.1	52	3.3	112	7.0	172	10.8
53	9 28.3	9 29.8	9 02.4	53	3.3	113	7.1	173	10.8
54	9 28.5	9 30.1	9 02.6	54	3.4	114	7.1	174	10.9
55	9 28.8	9 30.3	9 02.8	55	3.4	115	7.2	175	10.9
56	9 29.0	9 30.6	9 03.1	56	3.5	116	7.3	176	11.0
57	9 29.3	9 30.8	9 03.3	57	3.6	117	7.3	177	11.1
58	9 29.5	9 31.1	9 03.6	58	3.6	118	7.4	178	11.1
59	9 29.8	9 31.3	9 03.8	59	3.7	119	7.4	179	11.2
60	9 30.0	9 31.6	9 04.0	60	3.8	120	7.5	180	11.3

38m

Sec.	SUN PLANET	♈	MOON	code	corr'n	code	corr'n	code	corr'n
	° ′	° ′	° ′		′		′		′
0	9 30.0	9 31.6	9 04.0	0	0.0	60	3.9	120	7.7
1	9 30.3	9 31.8	9 04.3	1	0.1	61	3.9	121	7.8
2	9 30.5	9 32.1	9 04.5	2	0.1	62	4.0	122	7.8
3	9 30.8	9 32.3	9 04.7	3	0.2	63	4.0	123	7.9
4	9 31.0	9 32.6	9 05.0	4	0.3	64	4.1	124	8.0
5	9 31.3	9 32.8	9 05.2	5	0.3	65	4.2	125	8.0
6	9 31.5	9 33.1	9 05.5	6	0.4	66	4.2	126	8.1
7	9 31.8	9 33.3	9 05.7	7	0.4	67	4.3	127	8.1
8	9 32.0	9 33.6	9 05.9	8	0.5	68	4.4	128	8.2
9	9 32.3	9 33.8	9 06.2	9	0.6	69	4.4	129	8.3
10	9 32.5	9 34.1	9 06.4	10	0.6	70	4.5	130	8.3
11	9 32.8	9 34.3	9 06.7	11	0.7	71	4.6	131	8.4
12	9 33.0	9 34.6	9 06.9	12	0.8	72	4.6	132	8.5
13	9 33.3	9 34.8	9 07.1	13	0.8	73	4.7	133	8.5
14	9 33.5	9 35.1	9 07.4	14	0.9	74	4.7	134	8.6
15	9 33.8	9 35.3	9 07.6	15	1.0	75	4.8	135	8.7
16	9 34.0	9 35.6	9 07.9	16	1.0	76	4.9	136	8.7
17	9 34.3	9 35.8	9 08.1	17	1.1	77	4.9	137	8.8
18	9 34.5	9 36.1	9 08.3	18	1.2	78	5.0	138	8.9
19	9 34.8	9 36.3	9 08.6	19	1.2	79	5.1	139	8.9
20	9 35.0	9 36.6	9 08.8	20	1.3	80	5.1	140	9.0
21	9 35.3	9 36.8	9 09.0	21	1.3	81	5.2	141	9.0
22	9 35.5	9 37.1	9 09.3	22	1.4	82	5.3	142	9.1
23	9 35.8	9 37.3	9 09.5	23	1.5	83	5.3	143	9.2
24	9 36.0	9 37.6	9 09.8	24	1.5	84	5.4	144	9.2
25	9 36.3	9 37.8	9 10.0	25	1.6	85	5.5	145	9.3
26	9 36.5	9 38.1	9 10.2	26	1.7	86	5.5	146	9.4
27	9 36.8	9 38.3	9 10.5	27	1.7	87	5.6	147	9.4
28	9 37.0	9 38.6	9 10.7	28	1.8	88	5.6	148	9.5
29	9 37.3	9 38.8	9 11.0	29	1.9	89	5.7	149	9.6
30	9 37.5	9 39.1	9 11.2	30	1.9	90	5.8	150	9.6
31	9 37.8	9 39.3	9 11.4	31	2.0	91	5.8	151	9.7
32	9 38.0	9 39.6	9 11.7	32	2.1	92	5.9	152	9.8
33	9 38.3	9 39.8	9 11.9	33	2.1	93	6.0	153	9.8
34	9 38.5	9 40.1	9 12.1	34	2.2	94	6.0	154	9.9
35	9 38.8	9 40.3	9 12.4	35	2.2	95	6.1	155	9.9
36	9 39.0	9 40.6	9 12.6	36	2.3	96	6.2	156	10.0
37	9 39.3	9 40.8	9 12.9	37	2.4	97	6.2	157	10.1
38	9 39.5	9 41.1	9 13.1	38	2.4	98	6.3	158	10.1
39	9 39.8	9 41.3	9 13.3	39	2.5	99	6.4	159	10.2
40	9 40.0	9 41.6	9 13.6	40	2.6	100	6.4	160	10.3
41	9 40.3	9 41.8	9 13.8	41	2.6	101	6.5	161	10.3
42	9 40.5	9 42.1	9 14.1	42	2.7	102	6.5	162	10.4
43	9 40.8	9 42.3	9 14.3	43	2.8	103	6.6	163	10.5
44	9 41.0	9 42.6	9 14.5	44	2.8	104	6.7	164	10.5
45	9 41.3	9 42.8	9 14.8	45	2.9	105	6.7	165	10.6
46	9 41.5	9 43.1	9 15.0	46	3.0	106	6.8	166	10.7
47	9 41.8	9 43.3	9 15.2	47	3.0	107	6.9	167	10.7
48	9 42.0	9 43.6	9 15.5	48	3.1	108	6.9	168	10.8
49	9 42.3	9 43.8	9 15.7	49	3.1	109	7.0	169	10.8
50	9 42.5	9 44.1	9 16.0	50	3.2	110	7.1	170	10.9
51	9 42.8	9 44.3	9 16.2	51	3.3	111	7.1	171	11.0
52	9 43.0	9 44.6	9 16.4	52	3.3	112	7.2	172	11.0
53	9 43.3	9 44.8	9 16.7	53	3.4	113	7.3	173	11.1
54	9 43.5	9 45.1	9 16.9	54	3.5	114	7.3	174	11.2
55	9 43.8	9 45.3	9 17.2	55	3.5	115	7.4	175	11.2
56	9 44.0	9 45.6	9 17.4	56	3.6	116	7.4	176	11.3
57	9 44.3	9 45.8	9 17.6	57	3.7	117	7.5	177	11.4
58	9 44.5	9 46.1	9 17.9	58	3.7	118	7.6	178	11.4
59	9 44.8	9 46.4	9 18.1	59	3.8	119	7.6	179	11.5
60	9 45.0	9 46.6	9 18.4	60	3.9	120	7.7	180	11.6

39m

Sec.	SUN PLANET	♈	MOON	code	corr'n	code	corr'n	code	corr'n
	° ′	° ′	° ′		′		′		′
0	9 45.0	9 46.6	9 18.4	0	0.0	60	4.0	120	7.9
1	9 45.3	9 46.9	9 18.6	1	0.1	61	4.0	121	8.0
2	9 45.5	9 47.1	9 18.8	2	0.1	62	4.1	122	8.0
3	9 45.8	9 47.4	9 19.1	3	0.2	63	4.1	123	8.1
4	9 46.0	9 47.6	9 19.3	4	0.3	64	4.2	124	8.2
5	9 46.3	9 47.9	9 19.5	5	0.3	65	4.3	125	8.2
6	9 46.5	9 48.1	9 19.8	6	0.4	66	4.3	126	8.3
7	9 46.8	9 48.4	9 20.0	7	0.5	67	4.4	127	8.4
8	9 47.0	9 48.6	9 20.3	8	0.5	68	4.5	128	8.4
9	9 47.3	9 48.9	9 20.5	9	0.6	69	4.5	129	8.5
10	9 47.5	9 49.1	9 20.7	10	0.7	70	4.6	130	8.6
11	9 47.8	9 49.4	9 21.0	11	0.7	71	4.7	131	8.6
12	9 48.0	9 49.6	9 21.2	12	0.8	72	4.7	132	8.7
13	9 48.3	9 49.9	9 21.5	13	0.9	73	4.8	133	8.8
14	9 48.5	9 50.1	9 21.7	14	0.9	74	4.9	134	8.8
15	9 48.8	9 50.4	9 21.9	15	1.0	75	4.9	135	8.9
16	9 49.0	9 50.6	9 22.2	16	1.1	76	5.0	136	9.0
17	9 49.3	9 50.9	9 22.4	17	1.1	77	5.1	137	9.0
18	9 49.5	9 51.1	9 22.6	18	1.2	78	5.1	138	9.1
19	9 49.8	9 51.4	9 22.9	19	1.3	79	5.2	139	9.2
20	9 50.0	9 51.6	9 23.1	20	1.3	80	5.3	140	9.2
21	9 50.3	9 51.9	9 23.4	21	1.4	81	5.3	141	9.3
22	9 50.5	9 52.1	9 23.6	22	1.4	82	5.4	142	9.3
23	9 50.8	9 52.4	9 23.8	23	1.5	83	5.5	143	9.4
24	9 51.0	9 52.6	9 24.1	24	1.6	84	5.5	144	9.5
25	9 51.3	9 52.9	9 24.3	25	1.6	85	5.6	145	9.5
26	9 51.5	9 53.1	9 24.6	26	1.7	86	5.7	146	9.6
27	9 51.8	9 53.4	9 24.8	27	1.8	87	5.7	147	9.7
28	9 52.0	9 53.6	9 25.0	28	1.8	88	5.8	148	9.7
29	9 52.3	9 53.9	9 25.3	29	1.9	89	5.9	149	9.8
30	9 52.5	9 54.1	9 25.5	30	2.0	90	5.9	150	9.9
31	9 52.8	9 54.4	9 25.7	31	2.0	91	6.0	151	9.9
32	9 53.0	9 54.6	9 26.0	32	2.1	92	6.1	152	10.0
33	9 53.3	9 54.9	9 26.2	33	2.2	93	6.1	153	10.1
34	9 53.5	9 55.1	9 26.5	34	2.2	94	6.2	154	10.1
35	9 53.8	9 55.4	9 26.7	35	2.3	95	6.3	155	10.2
36	9 54.0	9 55.6	9 26.9	36	2.4	96	6.3	156	10.3
37	9 54.3	9 55.9	9 27.2	37	2.4	97	6.4	157	10.3
38	9 54.5	9 56.1	9 27.4	38	2.5	98	6.5	158	10.4
39	9 54.8	9 56.4	9 27.7	39	2.6	99	6.5	159	10.5
40	9 55.0	9 56.6	9 27.9	40	2.6	100	6.6	160	10.5
41	9 55.3	9 56.9	9 28.1	41	2.7	101	6.6	161	10.6
42	9 55.5	9 57.1	9 28.4	42	2.8	102	6.7	162	10.7
43	9 55.8	9 57.4	9 28.6	43	2.8	103	6.8	163	10.7
44	9 56.0	9 57.6	9 28.8	44	2.9	104	6.8	164	10.8
45	9 56.3	9 57.9	9 29.1	45	3.0	105	6.9	165	10.9
46	9 56.5	9 58.1	9 29.3	46	3.0	106	7.0	166	10.9
47	9 56.8	9 58.4	9 29.6	47	3.1	107	7.0	167	11.0
48	9 57.0	9 58.6	9 29.8	48	3.2	108	7.1	168	11.1
49	9 57.3	9 58.9	9 30.0	49	3.2	109	7.2	169	11.1
50	9 57.5	9 59.1	9 30.3	50	3.3	110	7.2	170	11.2
51	9 57.8	9 59.4	9 30.5	51	3.4	111	7.3	171	11.3
52	9 58.0	9 59.6	9 30.8	52	3.4	112	7.4	172	11.3
53	9 58.3	9 59.9	9 31.0	53	3.5	113	7.4	173	11.4
54	9 58.5	10 00.1	9 31.2	54	3.6	114	7.5	174	11.5
55	9 58.8	10 00.4	9 31.5	55	3.6	115	7.6	175	11.5
56	9 59.0	10 00.6	9 31.7	56	3.7	116	7.6	176	11.6
57	9 59.3	10 00.9	9 32.0	57	3.8	117	7.7	177	11.7
58	9 59.5	10 01.1	9 32.2	58	3.8	118	7.8	178	11.7
59	9 59.8	10 01.4	9 32.4	59	3.9	119	7.8	179	11.8
60	10 00.0	10 01.6	9 32.7	60	4.0	120	7.9	180	11.9

40m

Sec.	SUN PLANET	♈	MOON	code	corr'n	code	corr'n	code	corr'n
	° ′	° ′	° ′		′		′		′
0	10 00.0	10 01.6	9 32.7	0	0.0	60	4.1	120	8.1
1	10 00.3	10 01.9	9 32.9	1	0.1	61	4.1	121	8.2
2	10 00.5	10 02.1	9 33.1	2	0.1	62	4.2	122	8.2
3	10 00.8	10 02.4	9 33.4	3	0.2	63	4.3	123	8.3
4	10 01.0	10 02.6	9 33.6	4	0.3	64	4.3	124	8.4
5	10 01.3	10 02.9	9 33.9	5	0.3	65	4.4	125	8.4
6	10 01.5	10 03.1	9 34.1	6	0.4	66	4.5	126	8.5
7	10 01.8	10 03.4	9 34.3	7	0.5	67	4.5	127	8.6
8	10 02.0	10 03.6	9 34.6	8	0.5	68	4.6	128	8.6
9	10 02.3	10 03.9	9 34.8	9	0.6	69	4.7	129	8.7
10	10 02.5	10 04.1	9 35.1	10	0.7	70	4.7	130	8.8
11	10 02.8	10 04.4	9 35.3	11	0.7	71	4.8	131	8.8
12	10 03.0	10 04.7	9 35.5	12	0.8	72	4.9	132	8.9
13	10 03.3	10 04.9	9 35.8	13	0.9	73	4.9	133	9.0
14	10 03.5	10 05.2	9 36.0	14	0.9	74	5.0	134	9.0
15	10 03.8	10 05.4	9 36.2	15	1.0	75	5.1	135	9.1
16	10 04.0	10 05.7	9 36.5	16	1.1	76	5.1	136	9.2
17	10 04.3	10 05.9	9 36.7	17	1.1	77	5.2	137	9.2
18	10 04.5	10 06.2	9 37.0	18	1.2	78	5.3	138	9.3
19	10 04.8	10 06.4	9 37.2	19	1.3	79	5.3	139	9.4
20	10 05.0	10 06.7	9 37.4	20	1.4	80	5.4	140	9.5
21	10 05.3	10 06.9	9 37.7	21	1.4	81	5.5	141	9.5
22	10 05.5	10 07.2	9 37.9	22	1.5	82	5.5	142	9.6
23	10 05.8	10 07.4	9 38.2	23	1.6	83	5.6	143	9.7
24	10 06.0	10 07.7	9 38.4	24	1.6	84	5.7	144	9.7
25	10 06.3	10 07.9	9 38.6	25	1.7	85	5.7	145	9.8
26	10 06.5	10 08.2	9 38.9	26	1.8	86	5.8	146	9.9
27	10 06.8	10 08.4	9 39.1	27	1.8	87	5.9	147	9.9
28	10 07.0	10 08.7	9 39.3	28	1.9	88	5.9	148	10.0
29	10 07.3	10 08.9	9 39.6	29	2.0	89	6.0	149	10.1
30	10 07.5	10 09.2	9 39.8	30	2.0	90	6.1	150	10.1
31	10 07.8	10 09.4	9 40.1	31	2.1	91	6.1	151	10.2
32	10 08.0	10 09.7	9 40.3	32	2.2	92	6.2	152	10.3
33	10 08.3	10 09.9	9 40.5	33	2.2	93	6.3	153	10.3
34	10 08.5	10 10.2	9 40.8	34	2.3	94	6.3	154	10.4
35	10 08.8	10 10.4	9 41.0	35	2.4	95	6.4	155	10.5
36	10 09.0	10 10.7	9 41.3	36	2.4	96	6.5	156	10.5
37	10 09.3	10 10.9	9 41.5	37	2.5	97	6.5	157	10.6
38	10 09.5	10 11.2	9 41.7	38	2.6	98	6.6	158	10.7
39	10 09.8	10 11.4	9 42.0	39	2.6	99	6.7	159	10.7
40	10 10.0	10 11.7	9 42.2	40	2.7	100	6.8	160	10.8
41	10 10.3	10 11.9	9 42.4	41	2.8	101	6.8	161	10.9
42	10 10.5	10 12.2	9 42.7	42	2.8	102	6.9	162	10.9
43	10 10.8	10 12.4	9 42.9	43	2.9	103	7.0	163	11.0
44	10 11.0	10 12.7	9 43.2	44	3.0	104	7.0	164	11.1
45	10 11.3	10 12.9	9 43.4	45	3.0	105	7.1	165	11.1
46	10 11.5	10 13.2	9 43.6	46	3.1	106	7.2	166	11.2
47	10 11.8	10 13.4	9 43.9	47	3.2	107	7.2	167	11.3
48	10 12.0	10 13.7	9 44.1	48	3.2	108	7.3	168	11.3
49	10 12.3	10 13.9	9 44.4	49	3.3	109	7.4	169	11.4
50	10 12.5	10 14.2	9 44.6	50	3.4	110	7.4	170	11.5
51	10 12.8	10 14.4	9 44.8	51	3.4	111	7.5	171	11.5
52	10 13.0	10 14.7	9 45.1	52	3.5	112	7.6	172	11.6
53	10 13.3	10 14.9	9 45.3	53	3.6	113	7.6	173	11.7
54	10 13.5	10 15.2	9 45.6	54	3.6	114	7.7	174	11.7
55	10 13.8	10 15.4	9 45.8	55	3.7	115	7.8	175	11.8
56	10 14.0	10 15.7	9 46.0	56	3.8	116	7.8	176	11.9
57	10 14.3	10 15.9	9 46.3	57	3.8	117	7.9	177	11.9
58	10 14.5	10 16.2	9 46.5	58	3.9	118	8.0	178	12.0
59	10 14.8	10 16.4	9 46.7	59	4.0	119	8.0	179	12.1
60	10 15.0	10 16.7	9 47.0	60	4.1	120	8.1	180	12.2

41m

Sec.	SUN PLANET	♈	MOON	code	corr'n	code	corr'n	code	corr'n
	° ′	° ′	° ′		′		′		′
0	10 15.0	10 16.7	9 47.0	0	0.0	60	4.2	120	8.3
1	10 15.3	10 16.9	9 47.2	1	0.1	61	4.2	121	8.4
2	10 15.5	10 17.2	9 47.5	2	0.1	62	4.3	122	8.4
3	10 15.8	10 17.4	9 47.7	3	0.2	63	4.4	123	8.5
4	10 16.0	10 17.7	9 47.9	4	0.3	64	4.4	124	8.6
5	10 16.3	10 17.9	9 48.2	5	0.3	65	4.5	125	8.6
6	10 16.5	10 18.2	9 48.4	6	0.4	66	4.6	126	8.7
7	10 16.8	10 18.4	9 48.7	7	0.5	67	4.6	127	8.8
8	10 17.0	10 18.7	9 48.9	8	0.6	68	4.7	128	8.9
9	10 17.3	10 18.9	9 49.1	9	0.6	69	4.8	129	8.9
10	10 17.5	10 19.2	9 49.4	10	0.7	70	4.8	130	9.0
11	10 17.8	10 19.4	9 49.6	11	0.8	71	4.9	131	9.1
12	10 18.0	10 19.7	9 49.8	12	0.8	72	5.0	132	9.1
13	10 18.3	10 19.9	9 50.1	13	0.9	73	5.0	133	9.2
14	10 18.5	10 20.2	9 50.3	14	1.0	74	5.1	134	9.3
15	10 18.8	10 20.4	9 50.6	15	1.0	75	5.2	135	9.3
16	10 19.0	10 20.7	9 50.8	16	1.1	76	5.3	136	9.4
17	10 19.3	10 20.9	9 51.0	17	1.2	77	5.3	137	9.5
18	10 19.5	10 21.2	9 51.3	18	1.2	78	5.4	138	9.5
19	10 19.8	10 21.4	9 51.5	19	1.3	79	5.5	139	9.6
20	10 20.0	10 21.7	9 51.8	20	1.4	80	5.5	140	9.7
21	10 20.3	10 21.9	9 52.0	21	1.5	81	5.6	141	9.8
22	10 20.5	10 22.2	9 52.2	22	1.5	82	5.7	142	9.8
23	10 20.8	10 22.4	9 52.5	23	1.6	83	5.7	143	9.9
24	10 21.0	10 22.7	9 52.7	24	1.7	84	5.8	144	10.0
25	10 21.3	10 23.0	9 52.9	25	1.7	85	5.9	145	10.0
26	10 21.5	10 23.2	9 53.2	26	1.8	86	5.9	146	10.1
27	10 21.8	10 23.5	9 53.4	27	1.9	87	6.0	147	10.2
28	10 22.0	10 23.7	9 53.7	28	1.9	88	6.1	148	10.2
29	10 22.3	10 24.0	9 53.9	29	2.0	89	6.2	149	10.3
30	10 22.5	10 24.2	9 54.1	30	2.1	90	6.2	150	10.4
31	10 22.8	10 24.5	9 54.4	31	2.1	91	6.3	151	10.4
32	10 23.0	10 24.7	9 54.6	32	2.2	92	6.4	152	10.5
33	10 23.3	10 25.0	9 54.9	33	2.3	93	6.4	153	10.6
34	10 23.5	10 25.2	9 55.1	34	2.4	94	6.5	154	10.7
35	10 23.8	10 25.5	9 55.3	35	2.4	95	6.6	155	10.7
36	10 24.0	10 25.7	9 55.6	36	2.5	96	6.6	156	10.8
37	10 24.3	10 26.0	9 55.8	37	2.6	97	6.7	157	10.9
38	10 24.5	10 26.2	9 56.1	38	2.6	98	6.8	158	10.9
39	10 24.8	10 26.5	9 56.3	39	2.7	99	6.8	159	11.0
40	10 25.0	10 26.7	9 56.5	40	2.8	100	6.9	160	11.1
41	10 25.3	10 27.0	9 56.8	41	2.8	101	7.0	161	11.1
42	10 25.5	10 27.2	9 57.0	42	2.9	102	7.1	162	11.2
43	10 25.8	10 27.5	9 57.2	43	3.0	103	7.1	163	11.3
44	10 26.0	10 27.7	9 57.5	44	3.0	104	7.2	164	11.3
45	10 26.3	10 28.0	9 57.7	45	3.1	105	7.3	165	11.4
46	10 26.5	10 28.2	9 58.0	46	3.2	106	7.3	166	11.5
47	10 26.8	10 28.5	9 58.2	47	3.3	107	7.4	167	11.6
48	10 27.0	10 28.7	9 58.4	48	3.3	108	7.5	168	11.6
49	10 27.3	10 29.0	9 58.7	49	3.4	109	7.5	169	11.7
50	10 27.5	10 29.2	9 58.9	50	3.5	110	7.6	170	11.8
51	10 27.8	10 29.5	9 59.2	51	3.5	111	7.7	171	11.8
52	10 28.0	10 29.7	9 59.4	52	3.6	112	7.7	172	11.9
53	10 28.3	10 30.0	9 59.6	53	3.7	113	7.8	173	12.0
54	10 28.5	10 30.2	9 59.9	54	3.7	114	7.9	174	12.0
55	10 28.8	10 30.5	10 00.1	55	3.8	115	8.0	175	12.1
56	10 29.0	10 30.7	10 00.3	56	3.9	116	8.0	176	12.2
57	10 29.3	10 31.0	10 00.6	57	3.9	117	8.1	177	12.2
58	10 29.5	10 31.2	10 00.8	58	4.0	118	8.2	178	12.3
59	10 29.8	10 31.5	10 01.1	59	4.1	119	8.2	179	12.4
60	10 30.0	10 31.7	10 01.3	60	4.2	120	8.3	180	12.5

42m

Sec.	SUN PLANET ° ′	♈ ° ′	MOON ° ′	code	corr'n ′	code	corr'n ′	code	corr'n ′
0	10 30.0	10 31.7	10 01.3	0	0.0	60	4.3	120	8.5
1	10 30.3	10 32.0	10 01.5	1	0.1	61	4.3	121	8.6
2	10 30.5	10 32.2	10 01.8	2	0.1	62	4.4	122	8.6
3	10 30.8	10 32.5	10 02.0	3	0.2	63	4.5	123	8.7
4	10 31.0	10 32.7	10 02.3	4	0.3	64	4.5	124	8.8
5	10 31.3	10 33.0	10 02.5	5	0.4	65	4.6	125	8.9
6	10 31.5	10 33.2	10 02.7	6	0.4	66	4.7	126	8.9
7	10 31.8	10 33.5	10 03.0	7	0.5	67	4.7	127	9.0
8	10 32.0	10 33.7	10 03.2	8	0.6	68	4.8	128	9.1
9	10 32.3	10 34.0	10 03.4	9	0.6	69	4.9	129	9.1
10	10 32.5	10 34.2	10 03.7	10	0.7	70	5.0	130	9.2
11	10 32.8	10 34.5	10 03.9	11	0.8	71	5.0	131	9.3
12	10 33.0	10 34.7	10 04.2	12	0.9	72	5.1	132	9.4
13	10 33.3	10 35.0	10 04.4	13	0.9	73	5.2	133	9.4
14	10 33.5	10 35.2	10 04.6	14	1.0	74	5.2	134	9.5
15	10 33.8	10 35.5	10 04.9	15	1.1	75	5.3	135	9.6
16	10 34.0	10 35.7	10 05.1	16	1.1	76	5.4	136	9.6
17	10 34.3	10 36.0	10 05.4	17	1.2	77	5.5	137	9.7
18	10 34.5	10 36.2	10 05.6	18	1.3	78	5.5	138	9.8
19	10 34.8	10 36.5	10 05.8	19	1.3	79	5.6	139	9.8
20	10 35.0	10 36.7	10 06.1	20	1.4	80	5.7	140	9.9
21	10 35.3	10 37.0	10 06.3	21	1.5	81	5.7	141	10.0
22	10 35.5	10 37.2	10 06.5	22	1.6	82	5.8	142	10.1
23	10 35.8	10 37.5	10 06.8	23	1.6	83	5.9	143	10.1
24	10 36.0	10 37.7	10 07.0	24	1.7	84	6.0	144	10.2
25	10 36.3	10 38.0	10 07.3	25	1.8	85	6.0	145	10.3
26	10 36.5	10 38.2	10 07.5	26	1.8	86	6.1	146	10.3
27	10 36.8	10 38.5	10 07.7	27	1.9	87	6.2	147	10.4
28	10 37.0	10 38.7	10 08.0	28	2.0	88	6.2	148	10.5
29	10 37.3	10 39.0	10 08.2	29	2.1	89	6.3	149	10.6
30	10 37.5	10 39.2	10 08.5	30	2.1	90	6.4	150	10.6
31	10 37.8	10 39.5	10 08.7	31	2.2	91	6.4	151	10.7
32	10 38.0	10 39.7	10 08.9	32	2.3	92	6.5	152	10.8
33	10 38.3	10 40.0	10 09.2	33	2.3	93	6.6	153	10.8
34	10 38.5	10 40.2	10 09.4	34	2.4	94	6.7	154	10.9
35	10 38.8	10 40.5	10 09.7	35	2.5	95	6.7	155	11.0
36	10 39.0	10 40.7	10 09.9	36	2.6	96	6.8	156	11.1
37	10 39.3	10 41.0	10 10.1	37	2.6	97	6.9	157	11.1
38	10 39.5	10 41.3	10 10.4	38	2.7	98	6.9	158	11.2
39	10 39.8	10 41.5	10 10.6	39	2.8	99	7.0	159	11.3
40	10 40.0	10 41.8	10 10.8	40	2.8	100	7.1	160	11.3
41	10 40.3	10 42.0	10 11.1	41	2.9	101	7.2	161	11.4
42	10 40.5	10 42.3	10 11.3	42	3.0	102	7.2	162	11.5
43	10 40.8	10 42.5	10 11.6	43	3.0	103	7.3	163	11.5
44	10 41.0	10 42.8	10 11.8	44	3.1	104	7.4	164	11.6
45	10 41.3	10 43.0	10 12.0	45	3.2	105	7.4	165	11.7
46	10 41.5	10 43.3	10 12.3	46	3.3	106	7.5	166	11.8
47	10 41.8	10 43.5	10 12.5	47	3.3	107	7.6	167	11.8
48	10 42.0	10 43.8	10 12.8	48	3.4	108	7.7	168	11.9
49	10 42.3	10 44.0	10 13.0	49	3.5	109	7.7	169	12.0
50	10 42.5	10 44.3	10 13.2	50	3.5	110	7.8	170	12.0
51	10 42.8	10 44.5	10 13.5	51	3.6	111	7.9	171	12.1
52	10 43.0	10 44.8	10 13.7	52	3.7	112	7.9	172	12.2
53	10 43.3	10 45.0	10 13.9	53	3.8	113	8.0	173	12.3
54	10 43.5	10 45.3	10 14.2	54	3.8	114	8.1	174	12.3
55	10 43.8	10 45.5	10 14.4	55	3.9	115	8.1	175	12.4
56	10 44.0	10 45.8	10 14.7	56	4.0	116	8.2	176	12.5
57	10 44.3	10 46.0	10 14.9	57	4.0	117	8.3	177	12.5
58	10 44.5	10 46.3	10 15.1	58	4.1	118	8.4	178	12.6
59	10 44.8	10 46.5	10 15.4	59	4.2	119	8.4	179	12.7
60	10 45.0	10 46.8	10 15.6	60	4.3	120	8.5	180	12.8

43m

Sec.	SUN PLANET ° ′	♈ ° ′	MOON ° ′	code	corr'n ′	code	corr'n ′	code	corr'n ′
0	10 45.0	10 46.8	10 15.6	0	0.0	60	4.4	120	8.7
1	10 45.3	10 47.0	10 15.9	1	0.1	61	4.4	121	8.8
2	10 45.5	10 47.3	10 16.1	2	0.1	62	4.5	122	8.8
3	10 45.8	10 47.5	10 16.3	3	0.2	63	4.6	123	8.9
4	10 46.0	10 47.8	10 16.6	4	0.3	64	4.6	124	9.0
5	10 46.3	10 48.0	10 16.8	5	0.4	65	4.7	125	9.1
6	10 46.5	10 48.3	10 17.0	6	0.4	66	4.8	126	9.1
7	10 46.8	10 48.5	10 17.3	7	0.5	67	4.9	127	9.2
8	10 47.0	10 48.8	10 17.5	8	0.6	68	4.9	128	9.3
9	10 47.3	10 49.0	10 17.8	9	0.7	69	5.0	129	9.4
10	10 47.5	10 49.3	10 18.0	10	0.7	70	5.1	130	9.4
11	10 47.8	10 49.5	10 18.2	11	0.8	71	5.1	131	9.5
12	10 48.0	10 49.8	10 18.5	12	0.9	72	5.2	132	9.6
13	10 48.3	10 50.0	10 18.7	13	0.9	73	5.3	133	9.6
14	10 48.5	10 50.3	10 19.0	14	1.0	74	5.4	134	9.7
15	10 48.8	10 50.5	10 19.2	15	1.1	75	5.4	135	9.8
16	10 49.0	10 50.8	10 19.4	16	1.2	76	5.5	136	9.9
17	10 49.3	10 51.0	10 19.7	17	1.2	77	5.6	137	9.9
18	10 49.5	10 51.3	10 19.9	18	1.3	78	5.7	138	10.0
19	10 49.8	10 51.5	10 20.2	19	1.4	79	5.7	139	10.1
20	10 50.0	10 51.8	10 20.4	20	1.5	80	5.8	140	10.2
21	10 50.3	10 52.0	10 20.6	21	1.5	81	5.9	141	10.2
22	10 50.5	10 52.3	10 20.9	22	1.6	82	5.9	142	10.3
23	10 50.8	10 52.5	10 21.1	23	1.7	83	6.0	143	10.4
24	10 51.0	10 52.8	10 21.3	24	1.7	84	6.1	144	10.4
25	10 51.3	10 53.0	10 21.6	25	1.8	85	6.2	145	10.5
26	10 51.5	10 53.3	10 21.8	26	1.9	86	6.2	146	10.6
27	10 51.8	10 53.5	10 22.1	27	2.0	87	6.3	147	10.7
28	10 52.0	10 53.8	10 22.3	28	2.0	88	6.4	148	10.7
29	10 52.3	10 54.0	10 22.5	29	2.1	89	6.5	149	10.8
30	10 52.5	10 54.3	10 22.8	30	2.2	90	6.5	150	10.9
31	10 52.8	10 54.5	10 23.0	31	2.2	91	6.6	151	10.9
32	10 53.0	10 54.8	10 23.3	32	2.3	92	6.7	152	11.0
33	10 53.3	10 55.0	10 23.5	33	2.4	93	6.7	153	11.1
34	10 53.5	10 55.3	10 23.7	34	2.5	94	6.8	154	11.2
35	10 53.8	10 55.5	10 24.0	35	2.5	95	6.9	155	11.2
36	10 54.0	10 55.8	10 24.2	36	2.6	96	7.0	156	11.3
37	10 54.3	10 56.0	10 24.4	37	2.7	97	7.0	157	11.4
38	10 54.5	10 56.3	10 24.7	38	2.8	98	7.1	158	11.5
39	10 54.8	10 56.5	10 24.9	39	2.8	99	7.2	159	11.5
40	10 55.0	10 56.8	10 25.2	40	2.9	100	7.3	160	11.6
41	10 55.3	10 57.0	10 25.4	41	3.0	101	7.3	161	11.7
42	10 55.5	10 57.3	10 25.6	42	3.0	102	7.4	162	11.7
43	10 55.8	10 57.5	10 25.9	43	3.1	103	7.5	163	11.8
44	10 56.0	10 57.8	10 26.1	44	3.2	104	7.5	164	11.9
45	10 56.3	10 58.0	10 26.4	45	3.3	105	7.6	165	12.0
46	10 56.5	10 58.3	10 26.6	46	3.3	106	7.7	166	12.0
47	10 56.8	10 58.5	10 26.8	47	3.4	107	7.8	167	12.1
48	10 57.0	10 58.8	10 27.1	48	3.5	108	7.8	168	12.2
49	10 57.3	10 59.0	10 27.3	49	3.6	109	7.9	169	12.3
50	10 57.5	10 59.3	10 27.5	50	3.6	110	8.0	170	12.3
51	10 57.8	10 59.6	10 27.8	51	3.7	111	8.0	171	12.4
52	10 58.0	10 59.8	10 28.0	52	3.8	112	8.1	172	12.5
53	10 58.3	11 00.1	10 28.3	53	3.8	113	8.2	173	12.5
54	10 58.5	11 00.3	10 28.5	54	3.9	114	8.3	174	12.6
55	10 58.8	11 00.6	10 28.7	55	4.0	115	8.3	175	12.7
56	10 59.0	11 00.8	10 29.0	56	4.1	116	8.4	176	12.8
57	10 59.3	11 01.1	10 29.2	57	4.1	117	8.5	177	12.8
58	10 59.5	11 01.3	10 29.5	58	4.2	118	8.6	178	12.9
59	10 59.8	11 01.6	10 29.7	59	4.3	119	8.6	179	13.0
60	11 00.0	11 01.8	10 29.9	60	4.4	120	8.7	180	13.1

44ᵐ

Sec.	SUN PLANET	♈	MOON	code	corr'n	code	corr'n	code	corr'n
	° ′	° ′	° ′		′		′		′
0	11 00.0	11 01.8	10 29.9	0	0.0	60	4.5	120	8.9
1	11 00.3	11 02.1	10 30.2	1	0.1	61	4.5	121	9.0
2	11 00.5	11 02.3	10 30.4	2	0.1	62	4.6	122	9.0
3	11 00.8	11 02.6	10 30.6	3	0.2	63	4.7	123	9.1
4	11 01.0	11 02.8	10 30.9	4	0.3	64	4.7	124	9.2
5	11 01.3	11 03.1	10 31.1	5	0.4	65	4.8	125	9.3
6	11 01.5	11 03.3	10 31.4	6	0.4	66	4.9	126	9.3
7	11 01.8	11 03.6	10 31.6	7	0.5	67	5.0	127	9.4
8	11 02.0	11 03.8	10 31.8	8	0.6	68	5.0	128	9.5
9	11 02.3	11 04.1	10 32.1	9	0.7	69	5.1	129	9.6
10	11 02.5	11 04.3	10 32.3	10	0.7	70	5.2	130	9.6
11	11 02.8	11 04.6	10 32.6	11	0.8	71	5.3	131	9.7
12	11 03.0	11 04.8	10 32.8	12	0.9	72	5.3	132	9.8
13	11 03.3	11 05.1	10 33.0	13	1.0	73	5.4	133	9.9
14	11 03.5	11 05.3	10 33.3	14	1.0	74	5.5	134	9.9
15	11 03.8	11 05.6	10 33.5	15	1.1	75	5.6	135	10.0
16	11 04.0	11 05.8	10 33.8	16	1.2	76	5.6	136	10.1
17	11 04.3	11 06.1	10 34.0	17	1.3	77	5.7	137	10.2
18	11 04.5	11 06.3	10 34.2	18	1.3	78	5.8	138	10.2
19	11 04.8	11 06.6	10 34.5	19	1.4	79	5.9	139	10.3
20	11 05.0	11 06.8	10 34.7	20	1.5	80	5.9	140	10.4
21	11 05.3	11 07.1	10 34.9	21	1.6	81	6.0	141	10.5
22	11 05.5	11 07.3	10 35.2	22	1.6	82	6.1	142	10.5
23	11 05.8	11 07.6	10 35.4	23	1.7	83	6.2	143	10.6
24	11 06.0	11 07.8	10 35.7	24	1.8	84	6.2	144	10.7
25	11 06.3	11 08.1	10 35.9	25	1.9	85	6.3	145	10.8
26	11 06.5	11 08.3	10 36.1	26	1.9	86	6.4	146	10.8
27	11 06.8	11 08.6	10 36.4	27	2.0	87	6.5	147	10.9
28	11 07.0	11 08.8	10 36.6	28	2.1	88	6.5	148	11.0
29	11 07.3	11 09.1	10 36.9	29	2.2	89	6.6	149	11.1
30	11 07.5	11 09.3	10 37.1	30	2.2	90	6.7	150	11.1
31	11 07.8	11 09.6	10 37.3	31	2.3	91	6.7	151	11.2
32	11 08.0	11 09.8	10 37.6	32	2.4	92	6.8	152	11.3
33	11 08.3	11 10.1	10 37.8	33	2.4	93	6.9	153	11.3
34	11 08.5	11 10.3	10 38.0	34	2.5	94	7.0	154	11.4
35	11 08.8	11 10.6	10 38.3	35	2.6	95	7.0	155	11.5
36	11 09.0	11 10.8	10 38.5	36	2.7	96	7.1	156	11.6
37	11 09.3	11 11.1	10 38.8	37	2.7	97	7.2	157	11.6
38	11 09.5	11 11.3	10 39.0	38	2.8	98	7.3	158	11.7
39	11 09.8	11 11.6	10 39.2	39	2.9	99	7.3	159	11.8
40	11 10.0	11 11.8	10 39.5	40	3.0	100	7.4	160	11.9
41	11 10.3	11 12.1	10 39.7	41	3.0	101	7.5	161	11.9
42	11 10.5	11 12.3	10 40.0	42	3.1	102	7.6	162	12.0
43	11 10.8	11 12.6	10 40.2	43	3.2	103	7.6	163	12.1
44	11 11.0	11 12.8	10 40.4	44	3.3	104	7.7	164	12.2
45	11 11.3	11 13.1	10 40.7	45	3.3	105	7.8	165	12.2
46	11 11.5	11 13.3	10 40.9	46	3.4	106	7.9	166	12.3
47	11 11.8	11 13.6	10 41.1	47	3.5	107	7.9	167	12.4
48	11 12.0	11 13.8	10 41.4	48	3.6	108	8.0	168	12.5
49	11 12.3	11 14.1	10 41.6	49	3.6	109	8.1	169	12.5
50	11 12.5	11 14.3	10 41.9	50	3.7	110	8.2	170	12.6
51	11 12.8	11 14.6	10 42.1	51	3.8	111	8.2	171	12.7
52	11 13.0	11 14.8	10 42.3	52	3.9	112	8.3	172	12.8
53	11 13.3	11 15.1	10 42.6	53	3.9	113	8.4	173	12.8
54	11 13.5	11 15.3	10 42.8	54	4.0	114	8.5	174	12.9
55	11 13.8	11 15.6	10 43.1	55	4.1	115	8.5	175	13.0
56	11 14.0	11 15.8	10 43.3	56	4.2	116	8.6	176	13.1
57	11 14.3	11 16.1	10 43.5	57	4.2	117	8.7	177	13.1
58	11 14.5	11 16.3	10 43.8	58	4.3	118	8.8	178	13.2
59	11 14.8	11 16.6	10 44.0	59	4.4	119	8.8	179	13.3
60	11 15.0	11 16.8	10 44.3	60	4.5	120	8.9	180	13.4

45ᵐ

Sec.	SUN PLANET	♈	MOON	code	corr'n	code	corr'n	code	corr'n
	° ′	° ′	° ′		′		′		′
0	11 15.0	11 16.8	10 44.3	0	0.0	60	4.6	120	9.1
1	11 15.3	11 17.1	10 44.5	1	0.1	61	4.6	121	9.2
2	11 15.5	11 17.3	10 44.7	2	0.2	62	4.7	122	9.3
3	11 15.8	11 17.6	10 45.0	3	0.2	63	4.8	123	9.3
4	11 16.0	11 17.9	10 45.2	4	0.3	64	4.9	124	9.4
5	11 16.3	11 18.1	10 45.4	5	0.4	65	4.9	125	9.5
6	11 16.5	11 18.4	10 45.7	6	0.5	66	5.0	126	9.6
7	11 16.8	11 18.6	10 45.9	7	0.5	67	5.1	127	9.6
8	11 17.0	11 18.9	10 46.2	8	0.6	68	5.2	128	9.7
9	11 17.3	11 19.1	10 46.4	9	0.7	69	5.2	129	9.8
10	11 17.5	11 19.4	10 46.6	10	0.8	70	5.3	130	9.9
11	11 17.8	11 19.6	10 46.9	11	0.8	71	5.4	131	9.9
12	11 18.0	11 19.9	10 47.1	12	0.9	72	5.5	132	10.0
13	11 18.3	11 20.1	10 47.4	13	1.0	73	5.5	133	10.1
14	11 18.5	11 20.4	10 47.6	14	1.1	74	5.6	134	10.2
15	11 18.8	11 20.6	10 47.8	15	1.1	75	5.7	135	10.2
16	11 19.0	11 20.9	10 48.1	16	1.2	76	5.8	136	10.3
17	11 19.3	11 21.1	10 48.3	17	1.3	77	5.8	137	10.4
18	11 19.5	11 21.4	10 48.5	18	1.4	78	5.9	138	10.5
19	11 19.8	11 21.6	10 48.8	19	1.4	79	6.0	139	10.5
20	11 20.0	11 21.9	10 49.0	20	1.5	80	6.1	140	10.6
21	11 20.3	11 22.1	10 49.3	21	1.6	81	6.1	141	10.7
22	11 20.5	11 22.4	10 49.5	22	1.7	82	6.2	142	10.8
23	11 20.8	11 22.6	10 49.7	23	1.7	83	6.3	143	10.8
24	11 21.0	11 22.9	10 50.0	24	1.8	84	6.4	144	10.9
25	11 21.3	11 23.1	10 50.2	25	1.9	85	6.4	145	11.0
26	11 21.5	11 23.4	10 50.5	26	2.0	86	6.5	146	11.1
27	11 21.8	11 23.6	10 50.7	27	2.0	87	6.6	147	11.1
28	11 22.0	11 23.9	10 50.9	28	2.1	88	6.7	148	11.2
29	11 22.3	11 24.1	10 51.2	29	2.2	89	6.7	149	11.3
30	11 22.5	11 24.4	10 51.4	30	2.3	90	6.8	150	11.4
31	11 22.8	11 24.6	10 51.6	31	2.4	91	6.9	151	11.5
32	11 23.0	11 24.9	10 51.9	32	2.4	92	7.0	152	11.5
33	11 23.3	11 25.1	10 52.1	33	2.5	93	7.1	153	11.6
34	11 23.5	11 25.4	10 52.4	34	2.6	94	7.1	154	11.7
35	11 23.8	11 25.6	10 52.6	35	2.7	95	7.2	155	11.8
36	11 24.0	11 25.9	10 52.8	36	2.7	96	7.3	156	11.8
37	11 24.3	11 26.1	10 53.1	37	2.8	97	7.4	157	11.9
38	11 24.5	11 26.4	10 53.3	38	2.9	98	7.4	158	12.0
39	11 24.8	11 26.6	10 53.6	39	3.0	99	7.5	159	12.1
40	11 25.0	11 26.9	10 53.8	40	3.0	100	7.6	160	12.1
41	11 25.3	11 27.1	10 54.0	41	3.1	101	7.7	161	12.2
42	11 25.5	11 27.4	10 54.3	42	3.2	102	7.7	162	12.3
43	11 25.8	11 27.6	10 54.5	43	3.3	103	7.8	163	12.4
44	11 26.0	11 27.9	10 54.7	44	3.3	104	7.9	164	12.4
45	11 26.3	11 28.1	10 55.0	45	3.4	105	8.0	165	12.5
46	11 26.5	11 28.4	10 55.2	46	3.5	106	8.0	166	12.6
47	11 26.8	11 28.6	10 55.5	47	3.6	107	8.1	167	12.7
48	11 27.0	11 28.9	10 55.7	48	3.6	108	8.2	168	12.7
49	11 27.3	11 29.1	10 55.9	49	3.7	109	8.3	169	12.8
50	11 27.5	11 29.4	10 56.2	50	3.8	110	8.3	170	12.9
51	11 27.8	11 29.6	10 56.4	51	3.9	111	8.4	171	13.0
52	11 28.0	11 29.9	10 56.7	52	3.9	112	8.5	172	13.0
53	11 28.3	11 30.1	10 56.9	53	4.0	113	8.6	173	13.1
54	11 28.5	11 30.4	10 57.1	54	4.1	114	8.6	174	13.2
55	11 28.8	11 30.6	10 57.4	55	4.2	115	8.7	175	13.3
56	11 29.0	11 30.9	10 57.6	56	4.2	116	8.8	176	13.3
57	11 29.3	11 31.1	10 57.9	57	4.3	117	8.9	177	13.4
58	11 29.5	11 31.4	10 58.1	58	4.4	118	8.9	178	13.5
59	11 29.8	11 31.6	10 58.3	59	4.5	119	9.0	179	13.6
60	11 30.0	11 31.9	10 58.6	60	4.6	120	9.1	180	13.7

46m

Sec.	SUN PLANET	♈	MOON	code	corr'n	code	corr'n	code	corr'n
	° ′	° ′	° ′		′		′		′
0	11 30.0	11 31.9	10 58.6	0	0.0	60	4.7	120	9.3
1	11 30.3	11 32.1	10 58.8	1	0.1	61	4.7	121	9.4
2	11 30.5	11 32.4	10 59.0	2	0.2	62	4.8	122	9.5
3	11 30.8	11 32.6	10 59.3	3	0.2	63	4.9	123	9.5
4	11 31.0	11 32.9	10 59.5	4	0.3	64	5.0	124	9.6
5	11 31.3	11 33.1	10 59.8	5	0.4	65	5.0	125	9.7
6	11 31.5	11 33.4	11 00.0	6	0.5	66	5.1	126	9.8
7	11 31.8	11 33.6	11 00.2	7	0.5	67	5.2	127	9.8
8	11 32.0	11 33.9	11 00.5	8	0.6	68	5.3	128	9.9
9	11 32.3	11 34.1	11 00.7	9	0.7	69	5.3	129	10.0
10	11 32.5	11 34.4	11 01.0	10	0.8	70	5.4	130	10.1
11	11 32.8	11 34.6	11 01.2	11	0.9	71	5.5	131	10.2
12	11 33.0	11 34.9	11 01.4	12	0.9	72	5.6	132	10.2
13	11 33.3	11 35.1	11 01.7	13	1.0	73	5.7	133	10.3
14	11 33.5	11 35.4	11 01.9	14	1.1	74	5.7	134	10.4
15	11 33.8	11 35.6	11 02.1	15	1.2	75	5.8	135	10.5
16	11 34.0	11 35.9	11 02.4	16	1.2	76	5.9	136	10.5
17	11 34.3	11 36.2	11 02.6	17	1.3	77	6.0	137	10.6
18	11 34.5	11 36.4	11 02.9	18	1.4	78	6.0	138	10.7
19	11 34.8	11 36.7	11 03.1	19	1.5	79	6.1	139	10.8
20	11 35.0	11 36.9	11 03.3	20	1.6	80	6.2	140	10.9
21	11 35.3	11 37.2	11 03.6	21	1.6	81	6.3	141	10.9
22	11 35.5	11 37.4	11 03.8	22	1.7	82	6.4	142	11.0
23	11 35.8	11 37.7	11 04.1	23	1.8	83	6.4	143	11.1
24	11 36.0	11 37.9	11 04.3	24	1.9	84	6.5	144	11.2
25	11 36.3	11 38.2	11 04.5	25	1.9	85	6.6	145	11.2
26	11 36.5	11 38.4	11 04.8	26	2.0	86	6.7	146	11.3
27	11 36.8	11 38.7	11 05.0	27	2.1	87	6.7	147	11.4
28	11 37.0	11 38.9	11 05.2	28	2.2	88	6.8	148	11.5
29	11 37.3	11 39.2	11 05.5	29	2.2	89	6.9	149	11.5
30	11 37.5	11 39.4	11 05.7	30	2.3	90	7.0	150	11.6
31	11 37.8	11 39.7	11 06.0	31	2.4	91	7.1	151	11.7
32	11 38.0	11 39.9	11 06.2	32	2.5	92	7.1	152	11.8
33	11 38.3	11 40.2	11 06.4	33	2.6	93	7.2	153	11.9
34	11 38.5	11 40.4	11 06.7	34	2.6	94	7.3	154	11.9
35	11 38.8	11 40.7	11 06.9	35	2.7	95	7.4	155	12.0
36	11 39.0	11 40.9	11 07.2	36	2.8	96	7.4	156	12.1
37	11 39.3	11 41.2	11 07.4	37	2.9	97	7.5	157	12.2
38	11 39.5	11 41.4	11 07.6	38	2.9	98	7.6	158	12.2
39	11 39.8	11 41.7	11 07.9	39	3.0	99	7.7	159	12.3
40	11 40.0	11 41.9	11 08.1	40	3.1	100	7.8	160	12.4
41	11 40.3	11 42.2	11 08.3	41	3.2	101	7.8	161	12.5
42	11 40.5	11 42.4	11 08.6	42	3.3	102	7.9	162	12.6
43	11 40.8	11 42.7	11 08.8	43	3.3	103	8.0	163	12.6
44	11 41.0	11 42.9	11 09.1	44	3.4	104	8.1	164	12.7
45	11 41.3	11 43.2	11 09.3	45	3.5	105	8.1	165	12.8
46	11 41.5	11 43.4	11 09.5	46	3.6	106	8.2	166	12.9
47	11 41.8	11 43.7	11 09.8	47	3.6	107	8.3	167	12.9
48	11 42.0	11 43.9	11 10.0	48	3.7	108	8.4	168	13.0
49	11 42.3	11 44.2	11 10.3	49	3.8	109	8.4	169	13.1
50	11 42.5	11 44.4	11 10.5	50	3.9	110	8.5	170	13.2
51	11 42.8	11 44.7	11 10.7	51	4.0	111	8.6	171	13.3
52	11 43.0	11 44.9	11 11.0	52	4.0	112	8.7	172	13.3
53	11 43.3	11 45.2	11 11.2	53	4.1	113	8.8	173	13.4
54	11 43.5	11 45.4	11 11.5	54	4.2	114	8.8	174	13.5
55	11 43.8	11 45.7	11 11.7	55	4.3	115	8.9	175	13.6
56	11 44.0	11 45.9	11 11.9	56	4.3	116	9.0	176	13.6
57	11 44.3	11 46.2	11 12.2	57	4.4	117	9.1	177	13.7
58	11 44.5	11 46.4	11 12.4	58	4.5	118	9.1	178	13.8
59	11 44.8	11 46.7	11 12.6	59	4.6	119	9.2	179	13.9
60	11 45.0	11 46.9	11 12.9	60	4.7	120	9.3	180	14.0

47m

Sec.	SUN PLANET	♈	MOON	code	corr'n	code	corr'n	code	corr'n
	° ′	° ′	° ′		′		′		′
0	11 45.0	11 46.9	11 12.9	0	0.0	60	4.8	120	9.5
1	11 45.3	11 47.2	11 13.1	1	0.1	61	4.8	121	9.6
2	11 45.5	11 47.4	11 13.4	2	0.2	62	4.9	122	9.7
3	11 45.8	11 47.7	11 13.6	3	0.2	63	5.0	123	9.7
4	11 46.0	11 47.9	11 13.8	4	0.3	64	5.1	124	9.8
5	11 46.3	11 48.2	11 14.1	5	0.4	65	5.1	125	9.9
6	11 46.5	11 48.4	11 14.3	6	0.5	66	5.2	126	10.0
7	11 46.8	11 48.7	11 14.6	7	0.6	67	5.3	127	10.1
8	11 47.0	11 48.9	11 14.8	8	0.6	68	5.4	128	10.1
9	11 47.3	11 49.2	11 15.0	9	0.7	69	5.5	129	10.2
10	11 47.5	11 49.4	11 15.3	10	0.8	70	5.5	130	10.3
11	11 47.8	11 49.7	11 15.5	11	0.9	71	5.6	131	10.4
12	11 48.0	11 49.9	11 15.7	12	1.0	72	5.7	132	10.5
13	11 48.3	11 50.2	11 16.0	13	1.0	73	5.8	133	10.5
14	11 48.5	11 50.4	11 16.2	14	1.1	74	5.9	134	10.6
15	11 48.8	11 50.7	11 16.5	15	1.2	75	5.9	135	10.7
16	11 49.0	11 50.9	11 16.7	16	1.3	76	6.0	136	10.8
17	11 49.3	11 51.2	11 16.9	17	1.3	77	6.1	137	10.8
18	11 49.5	11 51.4	11 17.2	18	1.4	78	6.2	138	10.9
19	11 49.8	11 51.7	11 17.4	19	1.5	79	6.3	139	11.0
20	11 50.0	11 51.9	11 17.7	20	1.6	80	6.3	140	11.1
21	11 50.3	11 52.2	11 17.9	21	1.7	81	6.4	141	11.2
22	11 50.5	11 52.4	11 18.1	22	1.7	82	6.5	142	11.2
23	11 50.8	11 52.7	11 18.4	23	1.8	83	6.6	143	11.3
24	11 51.0	11 52.9	11 18.6	24	1.9	84	6.7	144	11.4
25	11 51.3	11 53.2	11 18.8	25	2.0	85	6.7	145	11.5
26	11 51.5	11 53.4	11 19.1	26	2.1	86	6.8	146	11.6
27	11 51.8	11 53.7	11 19.3	27	2.1	87	6.9	147	11.6
28	11 52.0	11 53.9	11 19.6	28	2.2	88	7.0	148	11.7
29	11 52.3	11 54.2	11 19.8	29	2.3	89	7.0	149	11.8
30	11 52.5	11 54.5	11 20.0	30	2.4	90	7.1	150	11.9
31	11 52.8	11 54.7	11 20.3	31	2.5	91	7.2	151	12.0
32	11 53.0	11 55.0	11 20.5	32	2.5	92	7.3	152	12.0
33	11 53.3	11 55.2	11 20.8	33	2.6	93	7.4	153	12.1
34	11 53.5	11 55.5	11 21.0	34	2.7	94	7.4	154	12.2
35	11 53.8	11 55.7	11 21.2	35	2.8	95	7.5	155	12.3
36	11 54.0	11 56.0	11 21.5	36	2.9	96	7.6	156	12.4
37	11 54.3	11 56.2	11 21.7	37	2.9	97	7.7	157	12.4
38	11 54.5	11 56.5	11 22.0	38	3.0	98	7.8	158	12.5
39	11 54.8	11 56.7	11 22.2	39	3.1	99	7.8	159	12.6
40	11 55.0	11 57.0	11 22.4	40	3.2	100	7.9	160	12.7
41	11 55.3	11 57.2	11 22.7	41	3.2	101	8.0	161	12.7
42	11 55.5	11 57.5	11 22.9	42	3.3	102	8.1	162	12.8
43	11 55.8	11 57.7	11 23.1	43	3.4	103	8.2	163	12.9
44	11 56.0	11 58.0	11 23.4	44	3.5	104	8.2	164	13.0
45	11 56.3	11 58.2	11 23.6	45	3.6	105	8.3	165	13.1
46	11 56.5	11 58.5	11 23.9	46	3.6	106	8.4	166	13.1
47	11 56.8	11 58.7	11 24.1	47	3.7	107	8.5	167	13.2
48	11 57.0	11 59.0	11 24.3	48	3.8	108	8.6	168	13.3
49	11 57.3	11 59.2	11 24.6	49	3.9	109	8.6	169	13.4
50	11 57.5	11 59.5	11 24.8	50	4.0	110	8.7	170	13.5
51	11 57.8	11 59.7	11 25.1	51	4.0	111	8.8	171	13.5
52	11 58.0	12 00.0	11 25.3	52	4.1	112	8.9	172	13.6
53	11 58.3	12 00.2	11 25.5	53	4.2	113	8.9	173	13.7
54	11 58.5	12 00.5	11 25.8	54	4.3	114	9.0	174	13.8
55	11 58.8	12 00.7	11 26.0	55	4.4	115	9.1	175	13.9
56	11 59.0	12 01.0	11 26.2	56	4.4	116	9.2	176	13.9
57	11 59.3	12 01.2	11 26.5	57	4.5	117	9.3	177	14.0
58	11 59.5	12 01.5	11 26.7	58	4.6	118	9.3	178	14.1
59	11 59.8	12 01.7	11 27.0	59	4.7	119	9.4	179	14.2
60	12 00.0	12 02.0	11 27.2	60	4.8	120	9.5	180	14.3

48^m

Sec.	SUN PLANET	♈	MOON	code	corr'n	code	corr'n	code	corr'n
	° ′	° ′	° ′		′		′		′
0	12 00.0	12 02.0	11 27.2	0	0.0	60	4.9	120	9.7
1	12 00.3	12 02.2	11 27.4	1	0.1	61	4.9	121	9.8
2	12 00.5	12 02.5	11 27.7	2	0.2	62	5.0	122	9.9
3	12 00.8	12 02.7	11 27.9	3	0.2	63	5.1	123	9.9
4	12 01.0	12 03.0	11 28.2	4	0.3	64	5.2	124	10.0
5	12 01.3	12 03.2	11 28.4	5	0.4	65	5.3	125	10.1
6	12 01.5	12 03.5	11 28.6	6	0.5	66	5.3	126	10.2
7	12 01.8	12 03.7	11 28.9	7	0.6	67	5.4	127	10.3
8	12 02.0	12 04.0	11 29.1	8	0.6	68	5.5	128	10.3
9	12 02.3	12 04.2	11 29.3	9	0.7	69	5.6	129	10.4
10	12 02.5	12 04.5	11 29.6	10	0.8	70	5.7	130	10.5
11	12 02.8	12 04.7	11 29.8	11	0.9	71	5.7	131	10.6
12	12 03.0	12 05.0	11 30.1	12	1.0	72	5.8	132	10.7
13	12 03.3	12 05.2	11 30.3	13	1.1	73	5.9	133	10.8
14	12 03.5	12 05.5	11 30.5	14	1.1	74	6.0	134	10.8
15	12 03.8	12 05.7	11 30.8	15	1.2	75	6.1	135	10.9
16	12 04.0	12 06.0	11 31.0	16	1.3	76	6.1	136	11.0
17	12 04.3	12 06.2	11 31.3	17	1.4	77	6.2	137	11.1
18	12 04.5	12 06.5	11 31.5	18	1.5	78	6.3	138	11.2
19	12 04.8	12 06.7	11 31.7	19	1.5	79	6.4	139	11.2
20	12 05.0	12 07.0	11 32.0	20	1.6	80	6.5	140	11.3
21	12 05.3	12 07.2	11 32.2	21	1.7	81	6.5	141	11.4
22	12 05.5	12 07.5	11 32.4	22	1.8	82	6.6	142	11.5
23	12 05.8	12 07.7	11 32.7	23	1.9	83	6.7	143	11.6
24	12 06.0	12 08.0	11 32.9	24	1.9	84	6.8	144	11.6
25	12 06.3	12 08.2	11 33.2	25	2.0	85	6.9	145	11.7
26	12 06.5	12 08.5	11 33.4	26	2.1	86	7.0	146	11.8
27	12 06.8	12 08.7	11 33.6	27	2.2	87	7.0	147	11.9
28	12 07.0	12 09.0	11 33.9	28	2.3	88	7.1	148	12.0
29	12 07.3	12 09.2	11 34.1	29	2.3	89	7.2	149	12.0
30	12 07.5	12 09.5	11 34.4	30	2.4	90	7.3	150	12.1
31	12 07.8	12 09.7	11 34.6	31	2.5	91	7.4	151	12.2
32	12 08.0	12 10.0	11 34.8	32	2.6	92	7.4	152	12.3
33	12 08.3	12 10.2	11 35.1	33	2.7	93	7.5	153	12.4
34	12 08.5	12 10.5	11 35.3	34	2.7	94	7.6	154	12.4
35	12 08.8	12 10.7	11 35.6	35	2.8	95	7.7	155	12.5
36	12 09.0	12 11.0	11 35.8	36	2.9	96	7.8	156	12.6
37	12 09.3	12 11.2	11 36.0	37	3.0	97	7.8	157	12.7
38	12 09.5	12 11.5	11 36.3	38	3.1	98	7.9	158	12.8
39	12 09.8	12 11.7	11 36.5	39	3.2	99	8.0	159	12.9
40	12 10.0	12 12.0	11 36.7	40	3.2	100	8.1	160	12.9
41	12 10.3	12 12.2	11 37.0	41	3.3	101	8.2	161	13.0
42	12 10.5	12 12.5	11 37.2	42	3.4	102	8.2	162	13.1
43	12 10.8	12 12.8	11 37.5	43	3.5	103	8.3	163	13.2
44	12 11.0	12 13.0	11 37.7	44	3.6	104	8.4	164	13.3
45	12 11.3	12 13.3	11 37.9	45	3.6	105	8.5	165	13.3
46	12 11.5	12 13.5	11 38.2	46	3.7	106	8.6	166	13.4
47	12 11.8	12 13.8	11 38.4	47	3.8	107	8.6	167	13.5
48	12 12.0	12 14.0	11 38.7	48	3.9	108	8.7	168	13.6
49	12 12.3	12 14.3	11 38.9	49	4.0	109	8.8	169	13.7
50	12 12.5	12 14.5	11 39.1	50	4.0	110	8.9	170	13.7
51	12 12.8	12 14.8	11 39.4	51	4.1	111	9.0	171	13.8
52	12 13.0	12 15.0	11 39.6	52	4.2	112	9.1	172	13.9
53	12 13.3	12 15.3	11 39.8	53	4.3	113	9.1	173	14.0
54	12 13.5	12 15.5	11 40.1	54	4.4	114	9.2	174	14.1
55	12 13.8	12 15.8	11 40.3	55	4.4	115	9.3	175	14.1
56	12 14.0	12 16.0	11 40.6	56	4.5	116	9.4	176	14.2
57	12 14.3	12 16.3	11 40.8	57	4.6	117	9.5	177	14.3
58	12 14.5	12 16.5	11 41.0	58	4.7	118	9.5	178	14.4
59	12 14.8	12 16.8	11 41.3	59	4.8	119	9.6	179	14.5
60	12 15.0	12 17.0	11 41.5	60	4.9	120	9.7	180	14.6

49^m

Sec.	SUN PLANET	♈	MOON	code	corr'n	code	corr'n	code	corr'n
	° ′	° ′	° ′		′		′		′
0	12 15.0	12 17.0	11 41.5	0	0.0	60	5.0	120	9.9
1	12 15.3	12 17.3	11 41.8	1	0.1	61	5.0	121	10.0
2	12 15.5	12 17.5	11 42.0	2	0.2	62	5.1	122	10.1
3	12 15.8	12 17.8	11 42.2	3	0.2	63	5.2	123	10.1
4	12 16.0	12 18.0	11 42.5	4	0.3	64	5.3	124	10.2
5	12 16.3	12 18.3	11 42.7	5	0.4	65	5.4	125	10.3
6	12 16.5	12 18.5	11 42.9	6	0.5	66	5.4	126	10.4
7	12 16.8	12 18.8	11 43.2	7	0.6	67	5.5	127	10.5
8	12 17.0	12 19.0	11 43.4	8	0.7	68	5.6	128	10.6
9	12 17.3	12 19.3	11 43.7	9	0.7	69	5.7	129	10.6
10	12 17.5	12 19.5	11 43.9	10	0.8	70	5.8	130	10.7
11	12 17.8	12 19.8	11 44.1	11	0.9	71	5.9	131	10.8
12	12 18.0	12 20.0	11 44.4	12	1.0	72	5.9	132	10.9
13	12 18.3	12 20.3	11 44.6	13	1.1	73	6.0	133	11.0
14	12 18.5	12 20.5	11 44.9	14	1.2	74	6.1	134	11.1
15	12 18.8	12 20.8	11 45.1	15	1.2	75	6.2	135	11.1
16	12 19.0	12 21.0	11 45.3	16	1.3	76	6.3	136	11.2
17	12 19.3	12 21.3	11 45.6	17	1.4	77	6.4	137	11.3
18	12 19.5	12 21.5	11 45.8	18	1.5	78	6.4	138	11.4
19	12 19.8	12 21.8	11 46.1	19	1.6	79	6.5	139	11.5
20	12 20.0	12 22.0	11 46.3	20	1.7	80	6.6	140	11.6
21	12 20.3	12 22.3	11 46.5	21	1.7	81	6.7	141	11.6
22	12 20.5	12 22.5	11 46.8	22	1.8	82	6.8	142	11.7
23	12 20.8	12 22.8	11 47.0	23	1.9	83	6.8	143	11.8
24	12 21.0	12 23.0	11 47.2	24	2.0	84	6.9	144	11.9
25	12 21.3	12 23.3	11 47.5	25	2.1	85	7.0	145	12.0
26	12 21.5	12 23.5	11 47.7	26	2.1	86	7.1	146	12.0
27	12 21.8	12 23.8	11 48.0	27	2.2	87	7.2	147	12.1
28	12 22.0	12 24.0	11 48.2	28	2.3	88	7.3	148	12.2
29	12 22.3	12 24.3	11 48.4	29	2.4	89	7.3	149	12.3
30	12 22.5	12 24.5	11 48.7	30	2.5	90	7.4	150	12.4
31	12 22.8	12 24.8	11 48.9	31	2.6	91	7.5	151	12.5
32	12 23.0	12 25.0	11 49.2	32	2.6	92	7.6	152	12.5
33	12 23.3	12 25.3	11 49.4	33	2.7	93	7.7	153	12.6
34	12 23.5	12 25.5	11 49.6	34	2.8	94	7.8	154	12.7
35	12 23.8	12 25.8	11 49.9	35	2.9	95	7.8	155	12.8
36	12 24.0	12 26.0	11 50.1	36	3.0	96	7.9	156	12.9
37	12 24.3	12 26.3	11 50.3	37	3.1	97	8.0	157	13.0
38	12 24.5	12 26.5	11 50.6	38	3.1	98	8.1	158	13.0
39	12 24.8	12 26.8	11 50.8	39	3.2	99	8.2	159	13.1
40	12 25.0	12 27.0	11 51.1	40	3.3	100	8.3	160	13.2
41	12 25.3	12 27.3	11 51.3	41	3.4	101	8.3	161	13.3
42	12 25.5	12 27.5	11 51.5	42	3.5	102	8.4	162	13.4
43	12 25.8	12 27.8	11 51.8	43	3.5	103	8.5	163	13.4
44	12 26.0	12 28.0	11 52.0	44	3.6	104	8.6	164	13.5
45	12 26.3	12 28.3	11 52.3	45	3.7	105	8.7	165	13.6
46	12 26.5	12 28.5	11 52.5	46	3.8	106	8.7	166	13.7
47	12 26.8	12 28.8	11 52.7	47	3.9	107	8.8	167	13.8
48	12 27.0	12 29.0	11 53.0	48	4.0	108	8.9	168	13.9
49	12 27.3	12 29.3	11 53.2	49	4.0	109	9.0	169	13.9
50	12 27.5	12 29.5	11 53.4	50	4.1	110	9.1	170	14.0
51	12 27.8	12 29.8	11 53.7	51	4.2	111	9.2	171	14.1
52	12 28.0	12 30.0	11 53.9	52	4.3	112	9.2	172	14.2
53	12 28.3	12 30.3	11 54.2	53	4.4	113	9.3	173	14.3
54	12 28.5	12 30.5	11 54.4	54	4.5	114	9.4	174	14.4
55	12 28.8	12 30.8	11 54.6	55	4.5	115	9.5	175	14.4
56	12 29.0	12 31.1	11 54.9	56	4.6	116	9.6	176	14.5
57	12 29.3	12 31.3	11 55.1	57	4.7	117	9.7	177	14.6
58	12 29.5	12 31.6	11 55.4	58	4.8	118	9.7	178	14.7
59	12 29.8	12 31.8	11 55.6	59	4.9	119	9.8	179	14.8
60	12 30.0	12 32.1	11 55.8	60	5.0	120	9.9	180	14.9

50m

Sec.	SUN PLANET	♈	MOON	code	corr^n	code	corr^n	code	corr^n
	° ′	° ′	° ′		′		′		′
0	12 30.0	12 32.1	11 55.8	0	0.0	60	5.1	120	10.1
1	12 30.3	12 32.3	11 56.1	1	0.1	61	5.1	121	10.2
2	12 30.5	12 32.6	11 56.3	2	0.2	62	5.2	122	10.3
3	12 30.8	12 32.8	11 56.5	3	0.3	63	5.3	123	10.4
4	12 31.0	12 33.1	11 56.8	4	0.3	64	5.4	124	10.4
5	12 31.3	12 33.3	11 57.0	5	0.4	65	5.5	125	10.5
6	12 31.5	12 33.6	11 57.3	6	0.5	66	5.6	126	10.6
7	12 31.8	12 33.8	11 57.5	7	0.6	67	5.6	127	10.7
8	12 32.0	12 34.1	11 57.7	8	0.7	68	5.7	128	10.8
9	12 32.3	12 34.3	11 58.0	9	0.8	69	5.8	129	10.9
10	12 32.5	12 34.6	11 58.2	10	0.8	70	5.9	130	10.9
11	12 32.8	12 34.8	11 58.5	11	0.9	71	6.0	131	11.0
12	12 33.0	12 35.1	11 58.7	12	1.0	72	6.1	132	11.1
13	12 33.3	12 35.3	11 58.9	13	1.1	73	6.1	133	11.2
14	12 33.5	12 35.6	11 59.2	14	1.2	74	6.2	134	11.3
15	12 33.8	12 35.8	11 59.4	15	1.3	75	6.3	135	11.4
16	12 34.0	12 36.1	11 59.7	16	1.3	76	6.4	136	11.4
17	12 34.3	12 36.3	11 59.9	17	1.4	77	6.5	137	11.5
18	12 34.5	12 36.6	12 00.1	18	1.5	78	6.6	138	11.6
19	12 34.8	12 36.8	12 00.4	19	1.6	79	6.6	139	11.7
20	12 35.0	12 37.1	12 00.6	20	1.7	80	6.7	140	11.8
21	12 35.3	12 37.3	12 00.8	21	1.8	81	6.8	141	11.9
22	12 35.5	12 37.6	12 01.1	22	1.9	82	6.9	142	12.0
23	12 35.8	12 37.8	12 01.3	23	1.9	83	7.0	143	12.0
24	12 36.0	12 38.1	12 01.6	24	2.0	84	7.1	144	12.1
25	12 36.3	12 38.3	12 01.8	25	2.1	85	7.2	145	12.2
26	12 36.5	12 38.6	12 02.0	26	2.2	86	7.2	146	12.3
27	12 36.8	12 38.8	12 02.3	27	2.3	87	7.3	147	12.4
28	12 37.0	12 39.1	12 02.5	28	2.4	88	7.4	148	12.5
29	12 37.3	12 39.3	12 02.8	29	2.4	89	7.5	149	12.5
30	12 37.5	12 39.6	12 03.0	30	2.5	90	7.6	150	12.6
31	12 37.8	12 39.8	12 03.2	31	2.6	91	7.7	151	12.7
32	12 38.0	12 40.1	12 03.5	32	2.7	92	7.7	152	12.8
33	12 38.3	12 40.3	12 03.7	33	2.8	93	7.8	153	12.9
34	12 38.5	12 40.6	12 03.9	34	2.9	94	7.9	154	13.0
35	12 38.8	12 40.8	12 04.2	35	2.9	95	8.0	155	13.0
36	12 39.0	12 41.1	12 04.4	36	3.0	96	8.1	156	13.1
37	12 39.3	12 41.3	12 04.7	37	3.1	97	8.2	157	13.2
38	12 39.5	12 41.6	12 04.9	38	3.2	98	8.2	158	13.3
39	12 39.8	12 41.8	12 05.1	39	3.3	99	8.3	159	13.4
40	12 40.0	12 42.1	12 05.4	40	3.4	100	8.4	160	13.5
41	12 40.3	12 42.3	12 05.6	41	3.5	101	8.5	161	13.6
42	12 40.5	12 42.6	12 05.9	42	3.5	102	8.6	162	13.6
43	12 40.8	12 42.8	12 06.1	43	3.6	103	8.7	163	13.7
44	12 41.0	12 43.1	12 06.3	44	3.7	104	8.8	164	13.8
45	12 41.3	12 43.3	12 06.6	45	3.8	105	8.8	165	13.9
46	12 41.5	12 43.6	12 06.8	46	3.9	106	8.9	166	14.0
47	12 41.8	12 43.8	12 07.0	47	4.0	107	9.0	167	14.1
48	12 42.0	12 44.1	12 07.3	48	4.0	108	9.1	168	14.1
49	12 42.3	12 44.3	12 07.5	49	4.1	109	9.2	169	14.2
50	12 42.5	12 44.6	12 07.8	50	4.2	110	9.3	170	14.3
51	12 42.8	12 44.8	12 08.0	51	4.3	111	9.3	171	14.4
52	12 43.0	12 45.1	12 08.2	52	4.4	112	9.4	172	14.5
53	12 43.3	12 45.3	12 08.5	53	4.5	113	9.5	173	14.6
54	12 43.5	12 45.6	12 08.7	54	4.5	114	9.6	174	14.6
55	12 43.8	12 45.8	12 09.0	55	4.6	115	9.7	175	14.7
56	12 44.0	12 46.1	12 09.2	56	4.7	116	9.8	176	14.8
57	12 44.3	12 46.3	12 09.4	57	4.8	117	9.8	177	14.9
58	12 44.5	12 46.6	12 09.7	58	4.9	118	9.9	178	15.0
59	12 44.8	12 46.8	12 09.9	59	5.0	119	10.0	179	15.1
60	12 45.0	12 47.1	12 10.2	60	5.1	120	10.1	180	15.2

51m

Sec.	SUN PLANET	♈	MOON	code	corr^n	code	corr^n	code	corr^n
	° ′	° ′	° ′		′		′		′
0	12 45.0	12 47.1	12 10.2	0	0.0	60	5.2	120	10.3
1	12 45.3	12 47.3	12 10.4	1	0.1	61	5.2	121	10.4
2	12 45.5	12 47.6	12 10.6	2	0.2	62	5.3	122	10.5
3	12 45.8	12 47.8	12 10.9	3	0.3	63	5.4	123	10.6
4	12 46.0	12 48.1	12 11.1	4	0.3	64	5.5	124	10.6
5	12 46.3	12 48.3	12 11.3	5	0.4	65	5.6	125	10.7
6	12 46.5	12 48.6	12 11.6	6	0.5	66	5.7	126	10.8
7	12 46.8	12 48.8	12 11.8	7	0.6	67	5.8	127	10.9
8	12 47.0	12 49.1	12 12.1	8	0.7	68	5.8	128	11.0
9	12 47.3	12 49.4	12 12.3	9	0.8	69	5.9	129	11.1
10	12 47.5	12 49.6	12 12.5	10	0.9	70	6.0	130	11.2
11	12 47.8	12 49.9	12 12.8	11	0.9	71	6.1	131	11.2
12	12 48.0	12 50.1	12 13.0	12	1.0	72	6.2	132	11.3
13	12 48.3	12 50.4	12 13.3	13	1.1	73	6.3	133	11.4
14	12 48.5	12 50.6	12 13.5	14	1.2	74	6.4	134	11.5
15	12 48.8	12 50.9	12 13.7	15	1.3	75	6.4	135	11.6
16	12 49.0	12 51.1	12 14.0	16	1.4	76	6.5	136	11.7
17	12 49.3	12 51.4	12 14.2	17	1.5	77	6.6	137	11.8
18	12 49.5	12 51.6	12 14.4	18	1.5	78	6.7	138	11.8
19	12 49.8	12 51.9	12 14.7	19	1.6	79	6.8	139	11.9
20	12 50.0	12 52.1	12 14.9	20	1.7	80	6.9	140	12.0
21	12 50.3	12 52.4	12 15.2	21	1.8	81	7.0	141	12.1
22	12 50.5	12 52.6	12 15.4	22	1.9	82	7.0	142	12.2
23	12 50.8	12 52.9	12 15.6	23	2.0	83	7.1	143	12.3
24	12 51.0	12 53.1	12 15.9	24	2.1	84	7.2	144	12.4
25	12 51.3	12 53.4	12 16.1	25	2.1	85	7.3	145	12.4
26	12 51.5	12 53.6	12 16.4	26	2.2	86	7.4	146	12.5
27	12 51.8	12 53.9	12 16.6	27	2.3	87	7.5	147	12.6
28	12 52.0	12 54.1	12 16.8	28	2.4	88	7.6	148	12.7
29	12 52.3	12 54.4	12 17.1	29	2.5	89	7.6	149	12.8
30	12 52.5	12 54.6	12 17.3	30	2.6	90	7.7	150	12.9
31	12 52.8	12 54.9	12 17.5	31	2.7	91	7.8	151	13.0
32	12 53.0	12 55.1	12 17.8	32	2.7	92	7.9	152	13.0
33	12 53.3	12 55.4	12 18.0	33	2.8	93	8.0	153	13.1
34	12 53.5	12 55.6	12 18.3	34	2.9	94	8.1	154	13.2
35	12 53.8	12 55.9	12 18.5	35	3.0	95	8.2	155	13.3
36	12 54.0	12 56.1	12 18.7	36	3.1	96	8.2	156	13.4
37	12 54.3	12 56.4	12 19.0	37	3.2	97	8.3	157	13.5
38	12 54.5	12 56.6	12 19.2	38	3.3	98	8.4	158	13.6
39	12 54.8	12 56.9	12 19.5	39	3.3	99	8.5	159	13.6
40	12 55.0	12 57.1	12 19.7	40	3.4	100	8.6	160	13.7
41	12 55.3	12 57.4	12 19.9	41	3.5	101	8.7	161	13.8
42	12 55.5	12 57.6	12 20.2	42	3.6	102	8.8	162	13.9
43	12 55.8	12 57.9	12 20.4	43	3.7	103	8.8	163	14.0
44	12 56.0	12 58.1	12 20.6	44	3.8	104	8.9	164	14.1
45	12 56.3	12 58.4	12 20.9	45	3.9	105	9.0	165	14.2
46	12 56.5	12 58.6	12 21.1	46	3.9	106	9.1	166	14.2
47	12 56.8	12 58.9	12 21.4	47	4.0	107	9.2	167	14.3
48	12 57.0	12 59.1	12 21.6	48	4.1	108	9.3	168	14.4
49	12 57.3	12 59.4	12 21.8	49	4.2	109	9.4	169	14.5
50	12 57.5	12 59.6	12 22.1	50	4.3	110	9.4	170	14.6
51	12 57.8	12 59.9	12 22.3	51	4.4	111	9.5	171	14.7
52	12 58.0	13 00.1	12 22.6	52	4.5	112	9.6	172	14.8
53	12 58.3	13 00.4	12 22.8	53	4.5	113	9.7	173	14.8
54	12 58.5	13 00.6	12 23.0	54	4.6	114	9.8	174	14.9
55	12 58.8	13 00.9	12 23.3	55	4.7	115	9.9	175	15.0
56	12 59.0	13 01.1	12 23.5	56	4.8	116	10.0	176	15.1
57	12 59.3	13 01.4	12 23.8	57	4.9	117	10.0	177	15.2
58	12 59.5	13 01.6	12 24.0	58	5.0	118	10.1	178	15.3
59	12 59.8	13 01.9	12 24.2	59	5.1	119	10.2	179	15.4
60	13 00.0	13 02.1	12 24.5	60	5.2	120	10.3	180	15.5

52^{m}

Sec.	SUN PLANET	♈	MOON	code	corr'n	code	corr'n	code	corr'n
	° ′	° ′	° ′		′		′		′
0	13 00.0	13 02.1	12 24.5	0	0.0	60	5.3	120	10.5
1	13 00.3	13 02.4	12 24.7	1	0.1	61	5.3	121	10.6
2	13 00.5	13 02.6	12 24.9	2	0.2	62	5.4	122	10.7
3	13 00.8	13 02.9	12 25.2	3	0.3	63	5.5	123	10.8
4	13 01.0	13 03.1	12 25.4	4	0.4	64	5.6	124	10.9
5	13 01.3	13 03.4	12 25.7	5	0.4	65	5.7	125	10.9
6	13 01.5	13 03.6	12 25.9	6	0.5	66	5.8	126	11.0
7	13 01.8	13 03.9	12 26.1	7	0.6	67	5.9	127	11.1
8	13 02.0	13 04.1	12 26.4	8	0.7	68	6.0	128	11.2
9	13 02.3	13 04.4	12 26.6	9	0.8	69	6.0	129	11.3
10	13 02.5	13 04.6	12 26.9	10	0.9	70	6.1	130	11.4
11	13 02.8	13 04.9	12 27.1	11	1.0	71	6.2	131	11.5
12	13 03.0	13 05.1	12 27.3	12	1.1	72	6.3	132	11.6
13	13 03.3	13 05.4	12 27.6	13	1.1	73	6.4	133	11.6
14	13 03.5	13 05.6	12 27.8	14	1.2	74	6.5	134	11.7
15	13 03.8	13 05.9	12 28.0	15	1.3	75	6.6	135	11.8
16	13 04.0	13 06.1	12 28.3	16	1.4	76	6.7	136	11.9
17	13 04.3	13 06.4	12 28.5	17	1.5	77	6.7	137	12.0
18	13 04.5	13 06.6	12 28.8	18	1.6	78	6.8	138	12.1
19	13 04.8	13 06.9	12 29.0	19	1.7	79	6.9	139	12.2
20	13 05.0	13 07.1	12 29.2	20	1.8	80	7.0	140	12.3
21	13 05.3	13 07.4	12 29.5	21	1.8	81	7.1	141	12.3
22	13 05.5	13 07.7	12 29.7	22	1.9	82	7.2	142	12.4
23	13 05.8	13 07.9	12 30.0	23	2.0	83	7.3	143	12.5
24	13 06.0	13 08.2	12 30.2	24	2.1	84	7.4	144	12.6
25	13 06.3	13 08.4	12 30.4	25	2.2	85	7.4	145	12.7
26	13 06.5	13 08.7	12 30.7	26	2.3	86	7.5	146	12.8
27	13 06.8	13 08.9	12 30.9	27	2.4	87	7.6	147	12.9
28	13 07.0	13 09.2	12 31.1	28	2.5	88	7.7	148	13.0
29	13 07.3	13 09.4	12 31.4	29	2.5	89	7.8	149	13.0
30	13 07.5	13 09.7	12 31.6	30	2.6	90	7.9	150	13.1
31	13 07.8	13 09.9	12 31.9	31	2.7	91	8.0	151	13.2
32	13 08.0	13 10.2	12 32.1	32	2.8	92	8.1	152	13.3
33	13 08.3	13 10.4	12 32.3	33	2.9	93	8.1	153	13.4
34	13 08.5	13 10.7	12 32.6	34	3.0	94	8.2	154	13.5
35	13 08.8	13 10.9	12 32.8	35	3.1	95	8.3	155	13.6
36	13 09.0	13 11.2	12 33.1	36	3.2	96	8.4	156	13.7
37	13 09.3	13 11.4	12 33.3	37	3.2	97	8.5	157	13.7
38	13 09.5	13 11.7	12 33.5	38	3.3	98	8.6	158	13.8
39	13 09.8	13 11.9	12 33.8	39	3.4	99	8.7	159	13.9
40	13 10.0	13 12.2	12 34.0	40	3.5	100	8.8	160	14.0
41	13 10.3	13 12.4	12 34.2	41	3.6	101	8.8	161	14.1
42	13 10.5	13 12.7	12 34.5	42	3.7	102	8.9	162	14.2
43	13 10.8	13 12.9	12 34.7	43	3.8	103	9.0	163	14.3
44	13 11.0	13 13.2	12 35.0	44	3.9	104	9.1	164	14.4
45	13 11.3	13 13.4	12 35.2	45	3.9	105	9.2	165	14.4
46	13 11.5	13 13.7	12 35.4	46	4.0	106	9.3	166	14.5
47	13 11.8	13 13.9	12 35.7	47	4.1	107	9.4	167	14.6
48	13 12.0	13 14.2	12 35.9	48	4.2	108	9.5	168	14.7
49	13 12.3	13 14.4	12 36.2	49	4.3	109	9.5	169	14.8
50	13 12.5	13 14.7	12 36.4	50	4.4	110	9.6	170	14.9
51	13 12.8	13 14.9	12 36.6	51	4.5	111	9.7	171	15.0
52	13 13.0	13 15.2	12 36.9	52	4.6	112	9.8	172	15.1
53	13 13.3	13 15.4	12 37.1	53	4.6	113	9.9	173	15.1
54	13 13.5	13 15.7	12 37.4	54	4.7	114	10.0	174	15.2
55	13 13.8	13 15.9	12 37.6	55	4.8	115	10.1	175	15.3
56	13 14.0	13 16.2	12 37.8	56	4.9	116	10.2	176	15.4
57	13 14.3	13 16.4	12 38.1	57	5.0	117	10.2	177	15.5
58	13 14.5	13 16.7	12 38.3	58	5.1	118	10.3	178	15.6
59	13 14.8	13 16.9	12 38.5	59	5.2	119	10.4	179	15.7
60	13 15.0	13 17.2	12 38.8	60	5.3	120	10.5	180	15.8

53^{m}

Sec.	SUN PLANET	♈	MOON	code	corr'n	code	corr'n	code	corr'n
	° ′	° ′	° ′		′		′		′
0	13 15.0	13 17.2	12 38.8	0	0.0	60	5.4	120	10.7
1	13 15.3	13 17.4	12 39.0	1	0.1	61	5.4	121	10.8
2	13 15.5	13 17.7	12 39.3	2	0.2	62	5.5	122	10.9
3	13 15.8	13 17.9	12 39.5	3	0.3	63	5.6	123	11.0
4	13 16.0	13 18.2	12 39.7	4	0.4	64	5.7	124	11.1
5	13 16.3	13 18.4	12 40.0	5	0.4	65	5.8	125	11.1
6	13 16.5	13 18.7	12 40.2	6	0.5	66	5.9	126	11.2
7	13 16.8	13 18.9	12 40.5	7	0.6	67	6.0	127	11.3
8	13 17.0	13 19.2	12 40.7	8	0.7	68	6.1	128	11.4
9	13 17.3	13 19.4	12 40.9	9	0.8	69	6.2	129	11.5
10	13 17.5	13 19.7	12 41.2	10	0.9	70	6.2	130	11.6
11	13 17.8	13 19.9	12 41.4	11	1.0	71	6.3	131	11.7
12	13 18.0	13 20.2	12 41.6	12	1.1	72	6.4	132	11.8
13	13 18.3	13 20.4	12 41.9	13	1.2	73	6.5	133	11.9
14	13 18.5	13 20.7	12 42.1	14	1.2	74	6.6	134	11.9
15	13 18.8	13 20.9	12 42.4	15	1.3	75	6.7	135	12.0
16	13 19.0	13 21.2	12 42.6	16	1.4	76	6.8	136	12.1
17	13 19.3	13 21.4	12 42.8	17	1.5	77	6.9	137	12.2
18	13 19.5	13 21.7	12 43.1	18	1.6	78	7.0	138	12.3
19	13 19.8	13 21.9	12 43.3	19	1.7	79	7.0	139	12.4
20	13 20.0	13 22.2	12 43.6	20	1.8	80	7.1	140	12.5
21	13 20.3	13 22.4	12 43.8	21	1.9	81	7.2	141	12.6
22	13 20.5	13 22.7	12 44.0	22	2.0	82	7.3	142	12.7
23	13 20.8	13 22.9	12 44.3	23	2.1	83	7.4	143	12.8
24	13 21.0	13 23.2	12 44.5	24	2.1	84	7.5	144	12.8
25	13 21.3	13 23.4	12 44.7	25	2.2	85	7.6	145	12.9
26	13 21.5	13 23.7	12 45.0	26	2.3	86	7.7	146	13.0
27	13 21.8	13 23.9	12 45.2	27	2.4	87	7.8	147	13.1
28	13 22.0	13 24.2	12 45.5	28	2.5	88	7.8	148	13.2
29	13 22.3	13 24.4	12 45.7	29	2.6	89	7.9	149	13.3
30	13 22.5	13 24.7	12 45.9	30	2.7	90	8.0	150	13.4
31	13 22.8	13 24.9	12 46.2	31	2.8	91	8.1	151	13.5
32	13 23.0	13 25.2	12 46.4	32	2.9	92	8.2	152	13.6
33	13 23.3	13 25.4	12 46.7	33	2.9	93	8.3	153	13.6
34	13 23.5	13 25.7	12 46.9	34	3.0	94	8.4	154	13.7
35	13 23.8	13 26.0	12 47.1	35	3.1	95	8.5	155	13.8
36	13 24.0	13 26.2	12 47.4	36	3.2	96	8.6	156	13.9
37	13 24.3	13 26.5	12 47.6	37	3.3	97	8.6	157	14.0
38	13 24.5	13 26.7	12 47.9	38	3.4	98	8.7	158	14.1
39	13 24.8	13 27.0	12 48.1	39	3.5	99	8.8	159	14.2
40	13 25.0	13 27.2	12 48.3	40	3.6	100	8.9	160	14.3
41	13 25.3	13 27.5	12 48.6	41	3.7	101	9.0	161	14.4
42	13 25.5	13 27.7	12 48.8	42	3.7	102	9.1	162	14.4
43	13 25.8	13 28.0	12 49.0	43	3.8	103	9.2	163	14.5
44	13 26.0	13 28.2	12 49.3	44	3.9	104	9.3	164	14.6
45	13 26.3	13 28.5	12 49.5	45	4.0	105	9.4	165	14.7
46	13 26.5	13 28.7	12 49.8	46	4.1	106	9.5	166	14.8
47	13 26.8	13 29.0	12 50.0	47	4.2	107	9.5	167	14.9
48	13 27.0	13 29.2	12 50.2	48	4.3	108	9.6	168	15.0
49	13 27.3	13 29.5	12 50.5	49	4.4	109	9.7	169	15.1
50	13 27.5	13 29.7	12 50.7	50	4.5	110	9.8	170	15.2
51	13 27.8	13 30.0	12 51.0	51	4.5	111	9.9	171	15.2
52	13 28.0	13 30.2	12 51.2	52	4.6	112	10.0	172	15.3
53	13 28.3	13 30.5	12 51.4	53	4.7	113	10.1	173	15.4
54	13 28.5	13 30.7	12 51.7	54	4.8	114	10.2	174	15.5
55	13 28.8	13 31.0	12 51.9	55	4.9	115	10.3	175	15.6
56	13 29.0	13 31.2	12 52.1	56	5.0	116	10.3	176	15.7
57	13 29.3	13 31.5	12 52.4	57	5.1	117	10.4	177	15.8
58	13 29.5	13 31.7	12 52.6	58	5.2	118	10.5	178	15.9
59	13 29.8	13 32.0	12 52.9	59	5.3	119	10.6	179	16.0
60	13 30.0	13 32.2	12 53.1	60	5.4	120	10.7	180	16.1

54m

Sec.	SUN PLANET	♈	MOON	code	corr^n	code	corr^n	code	corr^n
	° ′	° ′	° ′		′		′		′
0	13 30.0	13 32.2	12 53.1	0	0.0	60	5.5	120	10.9
1	13 30.3	13 32.5	12 53.3	1	0.1	61	5.5	121	11.0
2	13 30.5	13 32.7	12 53.6	2	0.2	62	5.6	122	11.1
3	13 30.8	13 33.0	12 53.8	3	0.3	63	5.7	123	11.2
4	13 31.0	13 33.2	12 54.1	4	0.4	64	5.8	124	11.3
5	13 31.3	13 33.5	12 54.3	5	0.5	65	5.9	125	11.4
6	13 31.5	13 33.7	12 54.5	6	0.5	66	6.0	126	11.4
7	13 31.8	13 34.0	12 54.8	7	0.6	67	6.1	127	11.5
8	13 32.0	13 34.2	12 55.0	8	0.7	68	6.2	128	11.6
9	13 32.3	13 34.5	12 55.2	9	0.8	69	6.3	129	11.7
10	13 32.5	13 34.7	12 55.5	10	0.9	70	6.4	130	11.8
11	13 32.8	13 35.0	12 55.7	11	1.0	71	6.4	131	11.9
12	13 33.0	13 35.2	12 56.0	12	1.1	72	6.5	132	12.0
13	13 33.3	13 35.5	12 56.2	13	1.2	73	6.6	133	12.1
14	13 33.5	13 35.7	12 56.4	14	1.3	74	6.7	134	12.2
15	13 33.8	13 36.0	12 56.7	15	1.4	75	6.8	135	12.3
16	13 34.0	13 36.2	12 56.9	16	1.5	76	6.9	136	12.4
17	13 34.3	13 36.5	12 57.2	17	1.5	77	7.0	137	12.4
18	13 34.5	13 36.7	12 57.4	18	1.6	78	7.1	138	12.5
19	13 34.8	13 37.0	12 57.6	19	1.7	79	7.2	139	12.6
20	13 35.0	13 37.2	12 57.9	20	1.8	80	7.3	140	12.7
21	13 35.3	13 37.5	12 58.1	21	1.9	81	7.4	141	12.8
22	13 35.5	13 37.7	12 58.3	22	2.0	82	7.4	142	12.9
23	13 35.8	13 38.0	12 58.6	23	2.1	83	7.5	143	13.0
24	13 36.0	13 38.2	12 58.8	24	2.2	84	7.6	144	13.1
25	13 36.3	13 38.5	12 59.1	25	2.3	85	7.7	145	13.2
26	13 36.5	13 38.7	12 59.3	26	2.4	86	7.8	146	13.3
27	13 36.8	13 39.0	12 59.5	27	2.5	87	7.9	147	13.4
28	13 37.0	13 39.2	12 59.8	28	2.5	88	8.0	148	13.4
29	13 37.3	13 39.5	13 00.0	29	2.6	89	8.1	149	13.5
30	13 37.5	13 39.7	13 00.3	30	2.7	90	8.2	150	13.6
31	13 37.8	13 40.0	13 00.5	31	2.8	91	8.3	151	13.7
32	13 38.0	13 40.2	13 00.7	32	2.9	92	8.4	152	13.8
33	13 38.3	13 40.5	13 01.0	33	3.0	93	8.4	153	13.9
34	13 38.5	13 40.7	13 01.2	34	3.1	94	8.5	154	14.0
35	13 38.8	13 41.0	13 01.5	35	3.2	95	8.6	155	14.1
36	13 39.0	13 41.2	13 01.7	36	3.3	96	8.7	156	14.2
37	13 39.3	13 41.5	13 01.9	37	3.4	97	8.8	157	14.3
38	13 39.5	13 41.7	13 02.2	38	3.5	98	8.9	158	14.4
39	13 39.8	13 42.0	13 02.4	39	3.5	99	9.0	159	14.4
40	13 40.0	13 42.2	13 02.6	40	3.6	100	9.1	160	14.5
41	13 40.3	13 42.5	13 02.9	41	3.7	101	9.2	161	14.6
42	13 40.5	13 42.7	13 03.1	42	3.8	102	9.3	162	14.7
43	13 40.8	13 43.0	13 03.4	43	3.9	103	9.4	163	14.8
44	13 41.0	13 43.2	13 03.6	44	4.0	104	9.4	164	14.9
45	13 41.3	13 43.5	13 03.8	45	4.1	105	9.5	165	15.0
46	13 41.5	13 43.7	13 04.1	46	4.2	106	9.6	166	15.1
47	13 41.8	13 44.0	13 04.3	47	4.3	107	9.7	167	15.2
48	13 42.0	13 44.3	13 04.6	48	4.4	108	9.8	168	15.3
49	13 42.3	13 44.5	13 04.8	49	4.5	109	9.9	169	15.4
50	13 42.5	13 44.8	13 05.0	50	4.5	110	10.0	170	15.4
51	13 42.8	13 45.0	13 05.3	51	4.6	111	10.1	171	15.5
52	13 43.0	13 45.3	13 05.5	52	4.7	112	10.2	172	15.6
53	13 43.3	13 45.5	13 05.7	53	4.8	113	10.3	173	15.7
54	13 43.5	13 45.8	13 06.0	54	4.9	114	10.4	174	15.8
55	13 43.8	13 46.0	13 06.2	55	5.0	115	10.4	175	15.9
56	13 44.0	13 46.3	13 06.5	56	5.1	116	10.5	176	16.0
57	13 44.3	13 46.5	13 06.7	57	5.2	117	10.6	177	16.1
58	13 44.5	13 46.8	13 06.9	58	5.3	118	10.7	178	16.2
59	13 44.8	13 47.0	13 07.2	59	5.4	119	10.8	179	16.3
60	13 45.0	13 47.3	13 07.4	60	5.5	120	10.9	180	16.4

55m

Sec.	SUN PLANET	♈	MOON	code	corr^n	code	corr^n	code	corr^n
	° ′	° ′	° ′		′		′		′
0	13 45.0	13 47.3	13 07.4	0	0.0	60	5.6	120	11.1
1	13 45.3	13 47.5	13 07.7	1	0.1	61	5.6	121	11.2
2	13 45.5	13 47.8	13 07.9	2	0.2	62	5.7	122	11.3
3	13 45.8	13 48.0	13 08.1	3	0.3	63	5.8	123	11.4
4	13 46.0	13 48.3	13 08.4	4	0.4	64	5.9	124	11.5
5	13 46.3	13 48.5	13 08.6	5	0.5	65	6.0	125	11.6
6	13 46.5	13 48.8	13 08.8	6	0.6	66	6.1	126	11.7
7	13 46.8	13 49.0	13 09.1	7	0.6	67	6.2	127	11.7
8	13 47.0	13 49.3	13 09.3	8	0.7	68	6.3	128	11.8
9	13 47.3	13 49.5	13 09.6	9	0.8	69	6.4	129	11.9
10	13 47.5	13 49.8	13 09.8	10	0.9	70	6.5	130	12.0
11	13 47.8	13 50.0	13 10.0	11	1.0	71	6.6	131	12.1
12	13 48.0	13 50.3	13 10.3	12	1.1	72	6.7	132	12.2
13	13 48.3	13 50.5	13 10.5	13	1.2	73	6.8	133	12.3
14	13 48.5	13 50.8	13 10.8	14	1.3	74	6.8	134	12.4
15	13 48.8	13 51.0	13 11.0	15	1.4	75	6.9	135	12.5
16	13 49.0	13 51.3	13 11.2	16	1.5	76	7.0	136	12.6
17	13 49.3	13 51.5	13 11.5	17	1.6	77	7.1	137	12.7
18	13 49.5	13 51.8	13 11.7	18	1.7	78	7.2	138	12.8
19	13 49.8	13 52.0	13 12.0	19	1.8	79	7.3	139	12.9
20	13 50.0	13 52.3	13 12.2	20	1.9	80	7.4	140	13.0
21	13 50.3	13 52.5	13 12.4	21	1.9	81	7.5	141	13.0
22	13 50.5	13 52.8	13 12.7	22	2.0	82	7.6	142	13.1
23	13 50.8	13 53.0	13 12.9	23	2.1	83	7.7	143	13.2
24	13 51.0	13 53.3	13 13.1	24	2.2	84	7.8	144	13.3
25	13 51.3	13 53.5	13 13.4	25	2.3	85	7.9	145	13.4
26	13 51.5	13 53.8	13 13.6	26	2.4	86	8.0	146	13.5
27	13 51.8	13 54.0	13 13.9	27	2.5	87	8.0	147	13.6
28	13 52.0	13 54.3	13 14.1	28	2.6	88	8.1	148	13.7
29	13 52.3	13 54.5	13 14.3	29	2.7	89	8.2	149	13.8
30	13 52.5	13 54.8	13 14.6	30	2.8	90	8.3	150	13.9
31	13 52.8	13 55.0	13 14.8	31	2.9	91	8.4	151	14.0
32	13 53.0	13 55.3	13 15.1	32	3.0	92	8.5	152	14.1
33	13 53.3	13 55.5	13 15.3	33	3.1	93	8.6	153	14.2
34	13 53.5	13 55.8	13 15.5	34	3.1	94	8.7	154	14.2
35	13 53.8	13 56.0	13 15.8	35	3.2	95	8.8	155	14.3
36	13 54.0	13 56.3	13 16.0	36	3.3	96	8.9	156	14.4
37	13 54.3	13 56.5	13 16.2	37	3.4	97	9.0	157	14.5
38	13 54.5	13 56.8	13 16.5	38	3.5	98	9.1	158	14.6
39	13 54.8	13 57.0	13 16.7	39	3.6	99	9.2	159	14.7
40	13 55.0	13 57.3	13 17.0	40	3.7	100	9.3	160	14.8
41	13 55.3	13 57.5	13 17.2	41	3.8	101	9.3	161	14.9
42	13 55.5	13 57.8	13 17.4	42	3.9	102	9.4	162	15.0
43	13 55.8	13 58.0	13 17.7	43	4.0	103	9.5	163	15.1
44	13 56.0	13 58.3	13 17.9	44	4.1	104	9.6	164	15.2
45	13 56.3	13 58.5	13 18.2	45	4.2	105	9.7	165	15.3
46	13 56.5	13 58.8	13 18.4	46	4.3	106	9.8	166	15.4
47	13 56.8	13 59.0	13 18.6	47	4.3	107	9.9	167	15.4
48	13 57.0	13 59.3	13 18.9	48	4.4	108	10.0	168	15.5
49	13 57.3	13 59.5	13 19.1	49	4.5	109	10.1	169	15.6
50	13 57.5	13 59.8	13 19.3	50	4.6	110	10.2	170	15.7
51	13 57.8	14 00.0	13 19.6	51	4.7	111	10.3	171	15.8
52	13 58.0	14 00.3	13 19.8	52	4.8	112	10.4	172	15.9
53	13 58.3	14 00.5	13 20.1	53	4.9	113	10.5	173	16.0
54	13 58.5	14 00.8	13 20.3	54	5.0	114	10.5	174	16.1
55	13 58.8	14 01.0	13 20.5	55	5.1	115	10.6	175	16.2
56	13 59.0	14 01.3	13 20.8	56	5.2	116	10.7	176	16.3
57	13 59.3	14 01.5	13 21.0	57	5.3	117	10.8	177	16.4
58	13 59.5	14 01.8	13 21.3	58	5.4	118	10.9	178	16.5
59	13 59.8	14 02.0	13 21.5	59	5.5	119	11.0	179	16.6
60	14 00.0	14 02.3	13 21.7	60	5.6	120	11.1	180	16.7

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Sec.	SUN PLANET	♈	MOON	code	corr'n	code	corr'n	code	corr'n
	° ′	° ′	° ′		′		′		′
0	14 00.0	14 02.3	13 21.7	0	0.0	60	5.7	120	11.3
1	14 00.3	14 02.6	13 22.0	1	0.1	61	5.7	121	11.4
2	14 00.5	14 02.8	13 22.2	2	0.2	62	5.8	122	11.5
3	14 00.8	14 03.1	13 22.4	3	0.3	63	5.9	123	11.6
4	14 01.0	14 03.3	13 22.7	4	0.4	64	6.0	124	11.7
5	14 01.3	14 03.6	13 22.9	5	0.5	65	6.1	125	11.8
6	14 01.5	14 03.8	13 23.2	6	0.6	66	6.2	126	11.9
7	14 01.8	14 04.1	13 23.4	7	0.7	67	6.3	127	12.0
8	14 02.0	14 04.3	13 23.6	8	0.8	68	6.4	128	12.1
9	14 02.3	14 04.6	13 23.9	9	0.8	69	6.5	129	12.1
10	14 02.5	14 04.8	13 24.1	10	0.9	70	6.6	130	12.2
11	14 02.8	14 05.1	13 24.4	11	1.0	71	6.7	131	12.3
12	14 03.0	14 05.3	13 24.6	12	1.1	72	6.8	132	12.4
13	14 03.3	14 05.6	13 24.8	13	1.2	73	6.9	133	12.5
14	14 03.5	14 05.8	13 25.1	14	1.3	74	7.0	134	12.6
15	14 03.8	14 06.1	13 25.3	15	1.4	75	7.1	135	12.7
16	14 04.0	14 06.3	13 25.6	16	1.5	76	7.2	136	12.8
17	14 04.3	14 06.6	13 25.8	17	1.6	77	7.3	137	12.9
18	14 04.5	14 06.8	13 26.0	18	1.7	78	7.3	138	13.0
19	14 04.8	14 07.1	13 26.3	19	1.8	79	7.4	139	13.1
20	14 05.0	14 07.3	13 26.5	20	1.9	80	7.5	140	13.2
21	14 05.3	14 07.6	13 26.7	21	2.0	81	7.6	141	13.3
22	14 05.5	14 07.8	13 27.0	22	2.1	82	7.7	142	13.4
23	14 05.8	14 08.1	13 27.2	23	2.2	83	7.8	143	13.5
24	14 06.0	14 08.3	13 27.5	24	2.3	84	7.9	144	13.6
25	14 06.3	14 08.6	13 27.7	25	2.4	85	8.0	145	13.7
26	14 06.5	14 08.8	13 27.9	26	2.4	86	8.1	146	13.7
27	14 06.8	14 09.1	13 28.2	27	2.5	87	8.2	147	13.8
28	14 07.0	14 09.3	13 28.4	28	2.6	88	8.3	148	13.9
29	14 07.3	14 09.6	13 28.7	29	2.7	89	8.4	149	14.0
30	14 07.5	14 09.8	13 28.9	30	2.8	90	8.5	150	14.1
31	14 07.8	14 10.1	13 29.1	31	2.9	91	8.6	151	14.2
32	14 08.0	14 10.3	13 29.4	32	3.0	92	8.7	152	14.3
33	14 08.3	14 10.6	13 29.6	33	3.1	93	8.8	153	14.4
34	14 08.5	14 10.8	13 29.8	34	3.2	94	8.9	154	14.5
35	14 08.8	14 11.1	13 30.1	35	3.3	95	8.9	155	14.6
36	14 09.0	14 11.3	13 30.3	36	3.4	96	9.0	156	14.7
37	14 09.3	14 11.6	13 30.6	37	3.5	97	9.1	157	14.8
38	14 09.5	14 11.8	13 30.8	38	3.6	98	9.2	158	14.9
39	14 09.8	14 12.1	13 31.0	39	3.7	99	9.3	159	15.0
40	14 10.0	14 12.3	13 31.3	40	3.8	100	9.4	160	15.1
41	14 10.3	14 12.6	13 31.5	41	3.9	101	9.5	161	15.2
42	14 10.5	14 12.8	13 31.8	42	4.0	102	9.6	162	15.3
43	14 10.8	14 13.1	13 32.0	43	4.0	103	9.7	163	15.3
44	14 11.0	14 13.3	13 32.2	44	4.1	104	9.8	164	15.4
45	14 11.3	14 13.6	13 32.5	45	4.2	105	9.9	165	15.5
46	14 11.5	14 13.8	13 32.7	46	4.3	106	10.0	166	15.6
47	14 11.8	14 14.1	13 32.9	47	4.4	107	10.1	167	15.7
48	14 12.0	14 14.3	13 33.2	48	4.5	108	10.2	168	15.8
49	14 12.3	14 14.6	13 33.4	49	4.6	109	10.3	169	15.9
50	14 12.5	14 14.8	13 33.7	50	4.7	110	10.4	170	16.0
51	14 12.8	14 15.1	13 33.9	51	4.8	111	10.5	171	16.1
52	14 13.0	14 15.3	13 34.1	52	4.9	112	10.5	172	16.2
53	14 13.3	14 15.6	13 34.4	53	5.0	113	10.6	173	16.3
54	14 13.5	14 15.8	13 34.6	54	5.1	114	10.7	174	16.4
55	14 13.8	14 16.1	13 34.9	55	5.2	115	10.8	175	16.5
56	14 14.0	14 16.3	13 35.1	56	5.3	116	10.9	176	16.6
57	14 14.3	14 16.6	13 35.3	57	5.4	117	11.0	177	16.7
58	14 14.5	14 16.8	13 35.6	58	5.5	118	11.1	178	16.8
59	14 14.8	14 17.1	13 35.8	59	5.6	119	11.2	179	16.9
60	14 15.0	14 17.3	13 36.1	60	5.7	120	11.3	180	17.0

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Sec.	SUN PLANET	♈	MOON	code	corr'n	code	corr'n	code	corr'n
	° ′	° ′	° ′		′		′		′
0	14 15.0	14 17.3	13 36.1	0	0.0	60	5.8	120	11.5
1	14 15.3	14 17.6	13 36.3	1	0.1	61	5.8	121	11.6
2	14 15.5	14 17.8	13 36.5	2	0.2	62	5.9	122	11.7
3	14 15.8	14 18.1	13 36.8	3	0.3	63	6.0	123	11.8
4	14 16.0	14 18.3	13 37.0	4	0.4	64	6.1	124	11.9
5	14 16.3	14 18.6	13 37.2	5	0.5	65	6.2	125	12.0
6	14 16.5	14 18.8	13 37.5	6	0.6	66	6.3	126	12.1
7	14 16.8	14 19.1	13 37.7	7	0.7	67	6.4	127	12.2
8	14 17.0	14 19.3	13 38.0	8	0.8	68	6.5	128	12.3
9	14 17.3	14 19.6	13 38.2	9	0.9	69	6.6	129	12.4
10	14 17.5	14 19.8	13 38.4	10	1.0	70	6.7	130	12.5
11	14 17.8	14 20.1	13 38.7	11	1.1	71	6.8	131	12.6
12	14 18.0	14 20.3	13 38.9	12	1.2	72	6.9	132	12.7
13	14 18.3	14 20.6	13 39.2	13	1.2	73	7.0	133	12.7
14	14 18.5	14 20.9	13 39.4	14	1.3	74	7.1	134	12.8
15	14 18.8	14 21.1	13 39.6	15	1.4	75	7.2	135	12.9
16	14 19.0	14 21.4	13 39.9	16	1.5	76	7.3	136	13.0
17	14 19.3	14 21.6	13 40.1	17	1.6	77	7.4	137	13.1
18	14 19.5	14 21.9	13 40.3	18	1.7	78	7.5	138	13.2
19	14 19.8	14 22.1	13 40.6	19	1.8	79	7.6	139	13.3
20	14 20.0	14 22.4	13 40.8	20	1.9	80	7.7	140	13.4
21	14 20.3	14 22.6	13 41.1	21	2.0	81	7.8	141	13.5
22	14 20.5	14 22.9	13 41.3	22	2.1	82	7.9	142	13.6
23	14 20.8	14 23.1	13 41.5	23	2.2	83	8.0	143	13.7
24	14 21.0	14 23.4	13 41.8	24	2.3	84	8.1	144	13.8
25	14 21.3	14 23.6	13 42.0	25	2.4	85	8.1	145	13.9
26	14 21.5	14 23.9	13 42.3	26	2.5	86	8.2	146	14.0
27	14 21.8	14 24.1	13 42.5	27	2.6	87	8.3	147	14.1
28	14 22.0	14 24.4	13 42.7	28	2.7	88	8.4	148	14.2
29	14 22.3	14 24.6	13 43.0	29	2.8	89	8.5	149	14.3
30	14 22.5	14 24.9	13 43.2	30	2.9	90	8.6	150	14.4
31	14 22.8	14 25.1	13 43.4	31	3.0	91	8.7	151	14.5
32	14 23.0	14 25.4	13 43.7	32	3.1	92	8.8	152	14.6
33	14 23.3	14 25.6	13 43.9	33	3.2	93	8.9	153	14.7
34	14 23.5	14 25.9	13 44.2	34	3.3	94	9.0	154	14.8
35	14 23.8	14 26.1	13 44.4	35	3.4	95	9.1	155	14.9
36	14 24.0	14 26.4	13 44.6	36	3.5	96	9.2	156	15.0
37	14 24.3	14 26.6	13 44.9	37	3.5	97	9.3	157	15.0
38	14 24.5	14 26.9	13 45.1	38	3.6	98	9.4	158	15.1
39	14 24.8	14 27.1	13 45.4	39	3.7	99	9.5	159	15.2
40	14 25.0	14 27.4	13 45.6	40	3.8	100	9.6	160	15.3
41	14 25.3	14 27.6	13 45.8	41	3.9	101	9.7	161	15.4
42	14 25.5	14 27.9	13 46.1	42	4.0	102	9.8	162	15.5
43	14 25.8	14 28.1	13 46.3	43	4.1	103	9.9	163	15.6
44	14 26.0	14 28.4	13 46.5	44	4.2	104	10.0	164	15.7
45	14 26.3	14 28.6	13 46.8	45	4.3	105	10.1	165	15.8
46	14 26.5	14 28.9	13 47.0	46	4.4	106	10.2	166	15.9
47	14 26.8	14 29.1	13 47.3	47	4.5	107	10.3	167	16.0
48	14 27.0	14 29.4	13 47.5	48	4.6	108	10.4	168	16.1
49	14 27.3	14 29.6	13 47.7	49	4.7	109	10.4	169	16.2
50	14 27.5	14 29.9	13 48.0	50	4.8	110	10.5	170	16.3
51	14 27.8	14 30.1	13 48.2	51	4.9	111	10.6	171	16.4
52	14 28.0	14 30.4	13 48.5	52	5.0	112	10.7	172	16.5
53	14 28.3	14 30.6	13 48.7	53	5.1	113	10.8	173	16.6
54	14 28.5	14 30.9	13 48.9	54	5.2	114	10.9	174	16.7
55	14 28.8	14 31.1	13 49.2	55	5.3	115	11.0	175	16.8
56	14 29.0	14 31.4	13 49.4	56	5.4	116	11.1	176	16.9
57	14 29.3	14 31.6	13 49.7	57	5.5	117	11.2	177	17.0
58	14 29.5	14 31.9	13 49.9	58	5.6	118	11.3	178	17.1
59	14 29.8	14 32.1	13 50.1	59	5.7	119	11.4	179	17.2
60	14 30.0	14 32.4	13 50.4	60	5.8	120	11.5	180	17.3

58m

Sec.	SUN PLANET	♈	MOON	code	corr'n	code	corr'n	code	corr'n
	° ′	° ′	° ′		′		′		′
0	14 30.0	14 32.4	13 50.4	0	0.0	60	5.9	120	11.7
1	14 30.3	14 32.6	13 50.6	1	0.1	61	5.9	121	11.8
2	14 30.5	14 32.9	13 50.8	2	0.2	62	6.0	122	11.9
3	14 30.8	14 33.1	13 51.1	3	0.3	63	6.1	123	12.0
4	14 31.0	14 33.4	13 51.3	4	0.4	64	6.2	124	12.1
5	14 31.3	14 33.6	13 51.6	5	0.5	65	6.3	125	12.2
6	14 31.5	14 33.9	13 51.8	6	0.6	66	6.4	126	12.3
7	14 31.8	14 34.1	13 52.0	7	0.7	67	6.5	127	12.4
8	14 32.0	14 34.4	13 52.3	8	0.8	68	6.6	128	12.5
9	14 32.3	14 34.6	13 52.5	9	0.9	69	6.7	129	12.6
10	14 32.5	14 34.9	13 52.8	10	1.0	70	6.8	130	12.7
11	14 32.8	14 35.1	13 53.0	11	1.1	71	6.9	131	12.8
12	14 33.0	14 35.4	13 53.2	12	1.2	72	7.0	132	12.9
13	14 33.3	14 35.6	13 53.5	13	1.3	73	7.1	133	13.0
14	14 33.5	14 35.9	13 53.7	14	1.4	74	7.2	134	13.1
15	14 33.8	14 36.1	13 53.9	15	1.5	75	7.3	135	13.2
16	14 34.0	14 36.4	13 54.2	16	1.6	76	7.4	136	13.3
17	14 34.3	14 36.6	13 54.4	17	1.7	77	7.5	137	13.4
18	14 34.5	14 36.9	13 54.7	18	1.8	78	7.6	138	13.5
19	14 34.8	14 37.1	13 54.9	19	1.9	79	7.7	139	13.6
20	14 35.0	14 37.4	13 55.1	20	2.0	80	7.8	140	13.7
21	14 35.3	14 37.6	13 55.4	21	2.0	81	7.9	141	13.7
22	14 35.5	14 37.9	13 55.6	22	2.1	82	8.0	142	13.8
23	14 35.8	14 38.1	13 55.9	23	2.2	83	8.1	143	13.9
24	14 36.0	14 38.4	13 56.1	24	2.3	84	8.2	144	14.0
25	14 36.3	14 38.6	13 56.3	25	2.4	85	8.3	145	14.1
26	14 36.5	14 38.9	13 56.6	26	2.5	86	8.4	146	14.2
27	14 36.8	14 39.2	13 56.8	27	2.6	87	8.5	147	14.3
28	14 37.0	14 39.4	13 57.0	28	2.7	88	8.6	148	14.4
29	14 37.3	14 39.7	13 57.3	29	2.8	89	8.7	149	14.5
30	14 37.5	14 39.9	13 57.5	30	2.9	90	8.8	150	14.6
31	14 37.8	14 40.2	13 57.8	31	3.0	91	8.9	151	14.7
32	14 38.0	14 40.4	13 58.0	32	3.1	92	9.0	152	14.8
33	14 38.3	14 40.7	13 58.2	33	3.2	93	9.1	153	14.9
34	14 38.5	14 40.9	13 58.5	34	3.3	94	9.2	154	15.0
35	14 38.8	14 41.2	13 58.7	35	3.4	95	9.3	155	15.1
36	14 39.0	14 41.4	13 59.0	36	3.5	96	9.4	156	15.2
37	14 39.3	14 41.7	13 59.2	37	3.6	97	9.5	157	15.3
38	14 39.5	14 41.9	13 59.4	38	3.7	98	9.6	158	15.4
39	14 39.8	14 42.2	13 59.7	39	3.8	99	9.7	159	15.5
40	14 40.0	14 42.4	13 59.9	40	3.9	100	9.8	160	15.6
41	14 40.3	14 42.7	14 00.1	41	4.0	101	9.8	161	15.7
42	14 40.5	14 42.9	14 00.4	42	4.1	102	9.9	162	15.8
43	14 40.8	14 43.2	14 00.6	43	4.2	103	10.0	163	15.9
44	14 41.0	14 43.4	14 00.9	44	4.3	104	10.1	164	16.0
45	14 41.3	14 43.7	14 01.1	45	4.4	105	10.2	165	16.1
46	14 41.5	14 43.9	14 01.3	46	4.5	106	10.3	166	16.2
47	14 41.8	14 44.2	14 01.6	47	4.6	107	10.4	167	16.3
48	14 42.0	14 44.4	14 01.8	48	4.7	108	10.5	168	16.4
49	14 42.3	14 44.7	14 02.1	49	4.8	109	10.6	169	16.5
50	14 42.5	14 44.9	14 02.3	50	4.9	110	10.7	170	16.6
51	14 42.8	14 45.2	14 02.5	51	5.0	111	10.8	171	16.7
52	14 43.0	14 45.4	14 02.8	52	5.1	112	10.9	172	16.8
53	14 43.3	14 45.7	14 03.0	53	5.2	113	11.0	173	16.9
54	14 43.5	14 45.9	14 03.3	54	5.3	114	11.1	174	17.0
55	14 43.8	14 46.2	14 03.5	55	5.4	115	11.2	175	17.1
56	14 44.0	14 46.4	14 03.7	56	5.5	116	11.3	176	17.2
57	14 44.3	14 46.7	14 04.0	57	5.6	117	11.4	177	17.3
58	14 44.5	14 46.9	14 04.2	58	5.7	118	11.5	178	17.4
59	14 44.8	14 47.2	14 04.4	59	5.8	119	11.6	179	17.5
60	14 45.0	14 47.4	14 04.7	60	5.9	120	11.7	180	17.6

59m

Sec.	SUN PLANET	♈	MOON	code	corr'n	code	corr'n	code	corr'n
	° ′	° ′	° ′		′		′		′
0	14 45.0	14 47.4	14 04.7	0	0.0	60	6.0	120	11.9
1	14 45.3	14 47.7	14 04.9	1	0.1	61	6.0	121	12.0
2	14 45.5	14 47.9	14 05.2	2	0.2	62	6.1	122	12.1
3	14 45.8	14 48.2	14 05.4	3	0.3	63	6.2	123	12.2
4	14 46.0	14 48.4	14 05.6	4	0.4	64	6.3	124	12.3
5	14 46.3	14 48.7	14 05.9	5	0.5	65	6.4	125	12.4
6	14 46.5	14 48.9	14 06.1	6	0.6	66	6.5	126	12.5
7	14 46.8	14 49.2	14 06.4	7	0.7	67	6.6	127	12.6
8	14 47.0	14 49.4	14 06.6	8	0.8	68	6.7	128	12.7
9	14 47.3	14 49.7	14 06.8	9	0.9	69	6.8	129	12.8
10	14 47.5	14 49.9	14 07.1	10	1.0	70	6.9	130	12.9
11	14 47.8	14 50.2	14 07.3	11	1.1	71	7.0	131	13.0
12	14 48.0	14 50.4	14 07.5	12	1.2	72	7.1	132	13.1
13	14 48.3	14 50.7	14 07.8	13	1.3	73	7.2	133	13.2
14	14 48.5	14 50.9	14 08.0	14	1.4	74	7.3	134	13.3
15	14 48.8	14 51.2	14 08.3	15	1.5	75	7.4	135	13.4
16	14 49.0	14 51.4	14 08.5	16	1.6	76	7.5	136	13.5
17	14 49.3	14 51.7	14 08.7	17	1.7	77	7.6	137	13.6
18	14 49.5	14 51.9	14 09.0	18	1.8	78	7.7	138	13.7
19	14 49.8	14 52.2	14 09.2	19	1.9	79	7.8	139	13.8
20	14 50.0	14 52.4	14 09.5	20	2.0	80	7.9	140	13.9
21	14 50.3	14 52.7	14 09.7	21	2.1	81	8.0	141	14.0
22	14 50.5	14 52.9	14 09.9	22	2.2	82	8.1	142	14.1
23	14 50.8	14 53.2	14 10.2	23	2.3	83	8.2	143	14.2
24	14 51.0	14 53.4	14 10.4	24	2.4	84	8.3	144	14.3
25	14 51.3	14 53.7	14 10.6	25	2.5	85	8.4	145	14.4
26	14 51.5	14 53.9	14 10.9	26	2.6	86	8.5	146	14.5
27	14 51.8	14 54.2	14 11.1	27	2.7	87	8.6	147	14.6
28	14 52.0	14 54.4	14 11.4	28	2.8	88	8.7	148	14.7
29	14 52.3	14 54.7	14 11.6	29	2.9	89	8.8	149	14.8
30	14 52.5	14 54.9	14 11.8	30	3.0	90	8.9	150	14.9
31	14 52.8	14 55.2	14 12.1	31	3.1	91	9.0	151	15.0
32	14 53.0	14 55.4	14 12.3	32	3.2	92	9.1	152	15.1
33	14 53.3	14 55.7	14 12.6	33	3.3	93	9.2	153	15.2
34	14 53.5	14 55.9	14 12.8	34	3.4	94	9.3	154	15.3
35	14 53.8	14 56.2	14 13.0	35	3.5	95	9.4	155	15.4
36	14 54.0	14 56.4	14 13.3	36	3.6	96	9.5	156	15.5
37	14 54.3	14 56.7	14 13.5	37	3.7	97	9.6	157	15.6
38	14 54.5	14 56.9	14 13.8	38	3.8	98	9.7	158	15.7
39	14 54.8	14 57.2	14 14.0	39	3.9	99	9.8	159	15.8
40	14 55.0	14 57.5	14 14.2	40	4.0	100	9.9	160	15.9
41	14 55.3	14 57.7	14 14.5	41	4.1	101	10.0	161	16.0
42	14 55.5	14 58.0	14 14.7	42	4.2	102	10.1	162	16.1
43	14 55.8	14 58.2	14 14.9	43	4.3	103	10.2	163	16.2
44	14 56.0	14 58.5	14 15.2	44	4.4	104	10.3	164	16.3
45	14 56.3	14 58.7	14 15.4	45	4.5	105	10.4	165	16.4
46	14 56.5	14 59.0	14 15.7	46	4.6	106	10.5	166	16.5
47	14 56.8	14 59.2	14 15.9	47	4.7	107	10.6	167	16.6
48	14 57.0	14 59.5	14 16.1	48	4.8	108	10.7	168	16.7
49	14 57.3	14 59.7	14 16.4	49	4.9	109	10.8	169	16.8
50	14 57.5	15 00.0	14 16.6	50	5.0	110	10.9	170	16.9
51	14 57.8	15 00.2	14 16.9	51	5.1	111	11.0	171	17.0
52	14 58.0	15 00.5	14 17.1	52	5.2	112	11.1	172	17.1
53	14 58.3	15 00.7	14 17.3	53	5.3	113	11.2	173	17.2
54	14 58.5	15 01.0	14 17.6	54	5.4	114	11.3	174	17.3
55	14 58.8	15 01.2	14 17.8	55	5.5	115	11.4	175	17.4
56	14 59.0	15 01.5	14 18.0	56	5.6	116	11.5	176	17.5
57	14 59.3	15 01.7	14 18.3	57	5.7	117	11.6	177	17.6
58	14 59.5	15 02.0	14 18.5	58	5.8	118	11.7	178	17.7
59	14 59.8	15 02.2	14 18.8	59	5.9	119	11.8	179	17.8
60	15 00.0	15 02.5	14 19.0	60	6.0	120	11.9	180	17.9

NAVIGATIONAL STAR CHART

The star chart assists the navigator in identifying stars. The stars of each constellation are connected by dotted lines; the bright stars are identified by their Greek letters and the principal stars by their common names. The sidereal hour angle and declination of each star can be determined from the map by means of the network of vertical and horizontal lines. The SHA's are measured (0° to 360°) from the vertical line passing through the Vernal Equinox at 0°. The declinations are measured north and south (+ 90° to − 90°) from the celestial equator which is represented by a heavy horizontal line through the center.

The rectangular shape of the chart distorts the relative positions of the stars in the polar regions. For example the north polar region is distorted so that the pointer stars of the big dipper are not in alignment with Polaris. A globe would give a better representation, and an observer from the inside would see the constellations as they appear in the sky. Then the SHA lines would converge at the north and south poles and the equator and ecliptic would be circles.

An observer's local meridian at any given instant may be located on the chart by means of the SHA coordinates. The basic relation GHA* = GHA ♈ + SHA* may be written:

$$\text{SHA}^* = \text{GHA}^* - \text{GHA } ♈$$

For a star on the meridian the GHA* is equal to the west longitude, whence

$$\text{SHA (local meridian)} = \text{W Long.} - \text{GHA } ♈$$

East longitude may be converted into west longitude by subtracting from 360°.

Example: Locate on the chart the local meridian of an observer in longitude 110° W on Jan. 1, at 6^h GCT. From the daily page for Jan. 1, 2, 3, at 6^h, Jan. 1 the GHA ♈ = 190°. The SHA of his meridian will therefore be 110° + 360° − 190° = 280°.

The identification of a star directly overhead, i. e., in the zenith, is easily made since the point overhead is on the local meridian and also has a Dec. equal to the observer's latitude.

Example: Assume that the observer in the above example is in latitude 40° N and that a star in the zenith is to be identified. The SHA of the star is exactly equal to the SHA of the local meridian and was found to be 280°. The star's Dec. is + 40° since the observer's latitude is equal to the Dec. of a point in the zenith.

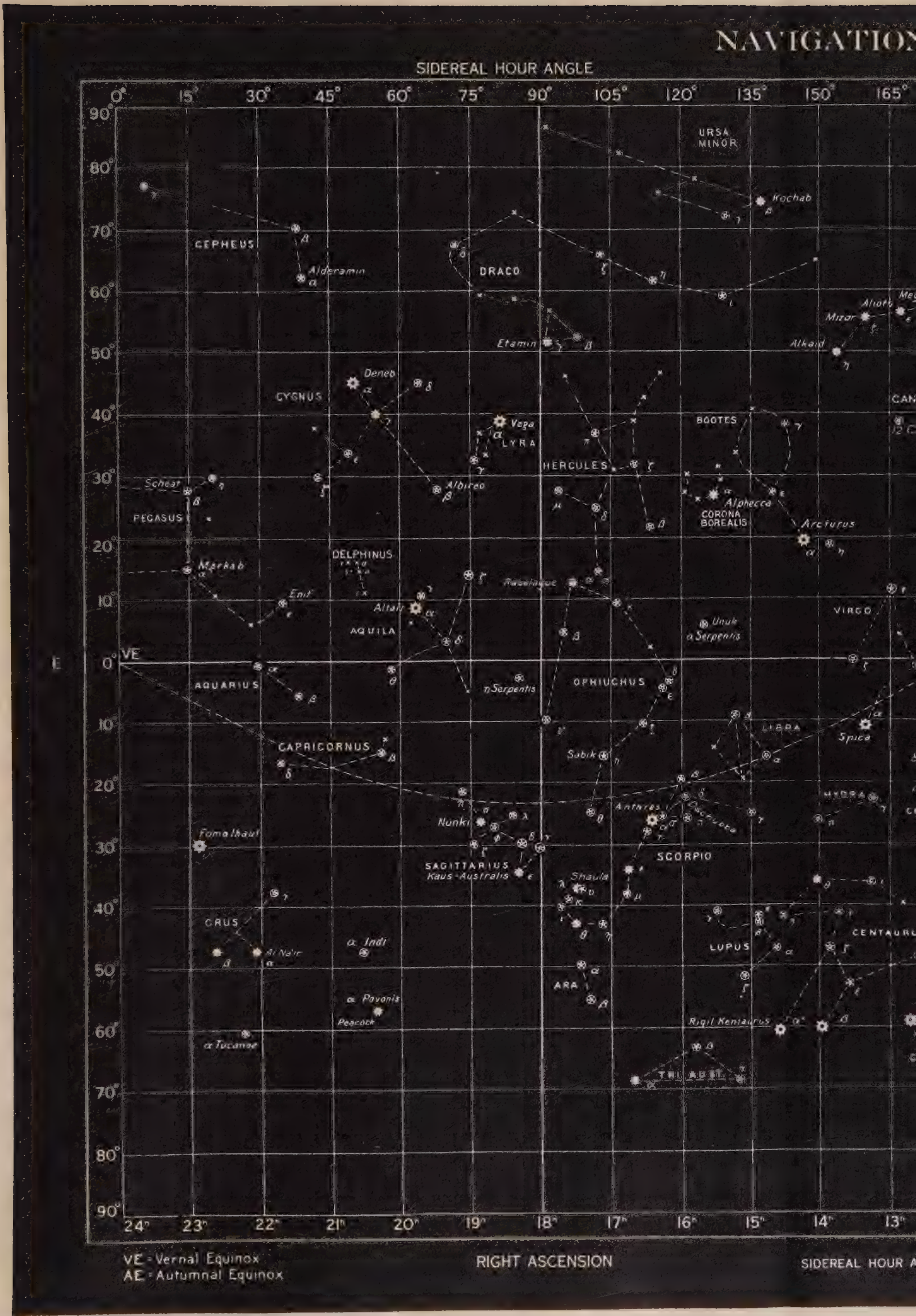
Examination of the chart in the region of SHA = 280° and Dec. = + 40° shows the brightest star in the region to be the first magnitude star Capella. To verify, this region of the chart may be compared in detail with the sky. One finds the conspicuous triangle formed by the three first magnitude stars Pollux, Aldebaran, and Capella.

A star to the north or south of the zenith is easily identified because its angular distance from the zenith is equal to the difference between its declination and the observer's latitude. Thus, in the above example, Rigel (Dec. −10°) would appear about 50° south of the zenith or at an altitude of 40°.

The chart may also be used with the "Star Identification Table" in H. O. 214. The table is used to convert an observed altitude and azimuth into Dec. and LHA; the LHA is converted into SHA, and the problem becomes that of the above example, i. e., identification from SHA and Dec. The SHA may be found by adding the LHA, if west, to the SHA of the local meridian and by subtracting it if east.

The ecliptic, which is the path of the Sun among the stars, is represented on the chart by a curved dotted line. The Moon and planets remain always within a few degrees of the ecliptic.

The SHA of a planet can be found by inspection from the daily page. First find the time when the GHA ♈ = 0°, then the GHA of any object at the corresponding time is also the SHA of that object.


NAVIGATION
SIDEREAL HOUR ANGLE
RIGHT ASCENSION
VE = Vernal Equinox
AE = Autumnal Equinox
URSA MINOR
Kochab
CEPHEUS
Alderamin
DRACO
Etamin
Mizar
Alioth
Alkaid
Deneb
CYGNUS
Vega
LYRA
HERCULES
BOOTES
Alphecca
CORONA BOREALIS
Arcturus
Scheat
PEGASUS
Albireo
DELPHINUS
Markab
Enif
Rasalague
Altair
AQUILA
VIRGO
Unuk
α Serpentis
AQUARIUS
η Serpentis
OPHIUCHUS
CAPRICORNUS
LIBRA
Spica
Sabik
Nunki
Antares
HYDRA
SAGITTARIUS
Kaus-Australis
SCORPIO
Fomalhaut
Shaula
GRUS
Al Nair
α Indi
LUPUS
CENTAURUS
ARA
α Pavonis
Peacock
Rigil Kentaurus
α Tucanae
TRI. AUST.
E
VE

The American Nautical Almanac—The American Air Almanac

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CORRECTION TO OBSERVED ALTITUDE OF MOON

Obs. Alt. °	0′–8′ ′	8′–15′ ′	15′–23′ ′	23′–30′ ′	30′–38′ ′	38′–45′ ′	45′–53′ ′	53′–60′ ′	Obs. Alt. °	0′–8′ ′	8′–15′ ′	15′–23′ ′	23′–30′ ′	30′–38′ ′	38′–45′ ′	45′–53′ ′	53′–60′ ′
1	32.6	33.6	34.5	35.3	36.1	36.9	37.6	38.2	46	38.6	38.5	38.5	38.4	38.3	38.2	38.1	38.0
2	38.8	39.4	40.0	40.5	41.0	41.4	41.9	42.3	47	37.9	37.8	37.8	37.7	37.6	37.5	37.4	37.3
3	42.7	43.1	43.4	43.8	44.1	44.4	44.7	45.0	48	37.2	37.1	37.1	37.0	36.9	36.8	36.7	36.6
4	45.2	45.5	45.8	46.0	46.2	46.4	46.6	46.8	49	36.5	36.4	36.3	36.2	36.2	36.1	36.0	35.9
5	47.0	47.2	47.4	47.6	47.7	47.9	48.0	48.2	50	35.8	35.7	35.6	35.5	35.4	35.3	35.2	35.1
6	48.3	48.4	48.6	48.7	48.8	48.9	49.0	49.1	51	35.0	35.0	34.9	34.8	34.7	34.6	34.5	34.4
7	49.2	49.3	49.4	49.5	49.6	49.7	49.8	49.9	52	34.3	34.2	34.1	34.0	33.9	33.8	33.7	33.6
8	49.9	50.0	50.1	50.2	50.3	50.3	50.4	50.4	53	33.5	33.4	33.3	33.2	33.1	33.0	33.0	32.9
9	50.5	50.5	50.6	50.6	50.7	50.7	50.8	50.8	54	32.8	32.7	32.6	32.5	32.4	32.3	32.2	32.1
10	50.9	50.9	50.9	51.0	51.0	51.0	51.1	51.1	55	32.0	31.9	31.8	31.7	31.6	31.5	31.4	31.3
11	51.1	51.2	51.2	51.2	51.2	51.3	51.3	51.3	56	31.2	31.1	31.0	30.9	30.8	30.7	30.6	30.5
12	51.3	51.3	51.4	51.4	51.4	51.4	51.4	51.4	57	30.4	30.3	30.2	30.1	30.0	29.9	29.8	29.7
13	51.4	51.5	51.5	51.5	51.5	51.5	51.5	51.5	58	29.6	29.4	29.3	29.2	29.1	29.0	28.9	28.8
14	51.5	51.5	51.5	51.5	51.5	51.5	51.5	51.5	59	28.7	28.6	28.5	28.4	28.3	28.2	28.1	28.0
15	51.5	51.5	51.5	51.5	51.5	51.5	51.5	51.5	60	27.9	27.8	27.7	27.6	27.5	27.4	27.3	27.2
16	51.5	51.5	51.4	51.4	51.4	51.4	51.4	51.4	61	27.0	26.9	26.8	26.7	26.6	26.5	26.4	26.3
17	51.4	51.4	51.4	51.3	51.3	51.3	51.3	51.3	62	26.2	26.1	26.0	25.9	25.8	25.7	25.5	25.4
18	51.3	51.2	51.2	51.2	51.2	51.2	51.1	51.1	63	25.3	25.2	25.1	25.0	24.9	24.8	24.7	24.6
19	51.1	51.1	51.1	51.0	51.0	51.0	51.0	50.9	64	24.5	24.4	24.2	24.1	24.0	23.9	23.8	23.7
20	50.9	50.9	50.9	50.8	50.8	50.8	50.8	50.7	65	23.6	23.5	23.4	23.3	23.1	23.0	22.9	22.8
21	50.7	50.7	50.6	50.6	50.6	50.6	50.5	50.5	66	22.7	22.6	22.5	22.4	22.3	22.1	22.0	21.9
22	50.5	50.4	50.4	50.4	50.3	50.3	50.3	50.2	67	21.8	21.7	21.6	21.5	21.4	21.2	21.1	21.0
23	50.2	50.2	50.1	50.1	50.0	50.0	50.0	49.9	68	20.9	20.8	20.7	20.6	20.5	20.3	20.2	20.1
24	49.9	49.9	49.8	49.8	49.7	49.7	49.7	49.6	69	20.0	19.9	19.8	19.7	19.5	19.4	19.3	19.2
25	49.6	49.5	49.5	49.5	49.4	49.4	49.3	49.3	70	19.1	19.0	18.9	18.7	18.6	18.5	18.4	18.3
26	49.2	49.2	49.2	49.1	49.1	49.0	49.0	48.9	71	18.2	18.1	17.9	17.8	17.7	17.6	17.5	17.4
27	48.9	48.8	48.8	48.7	48.7	48.6	48.6	48.5	72	17.2	17.1	17.0	16.9	16.8	16.7	16.5	16.4
28	48.5	48.4	48.4	48.3	48.3	48.2	48.2	48.1	73	16.3	16.2	16.1	16.0	15.8	15.7	15.6	15.5
29	48.1	48.0	48.0	47.9	47.9	47.8	47.8	47.7	74	15.4	15.3	15.1	15.0	14.9	14.8	14.7	14.6
30	47.7	47.6	47.6	47.5	47.5	47.4	47.3	47.3	75	14.4	14.3	14.2	14.1	14.0	13.8	13.7	13.6
31	47.2	47.2	47.1	47.1	47.0	46.9	46.9	46.8	76	13.5	13.4	13.3	13.1	13.0	12.9	12.8	12.7
32	46.8	46.7	46.7	46.6	46.5	46.5	46.4	46.4	77	12.5	12.4	12.3	12.2	12.1	11.9	11.8	11.7
33	46.3	46.2	46.2	46.1	46.0	46.0	45.9	45.9	78	11.6	11.5	11.3	11.2	11.1	11.0	10.9	10.7
34	45.8	45.7	45.7	45.6	45.5	45.5	45.4	45.4	79	10.6	10.5	10.4	10.3	10.1	10.0	9.9	9.8
35	45.3	45.2	45.2	45.1	45.0	45.0	44.9	44.8	80	9.7	9.5	9.4	9.3	9.2	9.1	8.9	8.8
36	44.8	44.7	44.6	44.6	44.5	44.4	44.3	44.3	81	8.7	8.6	8.5	8.3	8.2	8.1	8.0	7.9
37	44.2	44.1	44.1	44.0	43.9	43.9	43.8	43.7	82	7.7	7.6	7.5	7.4	7.2	7.1	7.0	6.9
38	43.7	43.6	43.5	43.4	43.4	43.3	43.2	43.1	83	6.8	6.6	6.5	6.4	6.3	6.2	6.0	5.9
39	43.1	43.0	42.9	42.9	42.8	42.7	42.6	42.6	84	5.8	5.7	5.5	5.4	5.3	5.2	5.1	4.9
40	42.5	42.4	42.3	42.3	42.2	42.1	42.0	42.0	85	4.8	4.7	4.6	4.5	4.3	4.2	4.1	4.0
41	41.9	41.8	41.7	41.6	41.6	41.5	41.4	41.4	86	3.8	3.7	3.6	3.5	3.4	3.2	3.1	3.0
42	41.3	41.2	41.1	41.0	40.9	40.9	40.8	40.7	87	2.9	2.7	2.6	2.5	2.4	2.3	2.1	2.0
43	40.6	40.5	40.5	40.4	40.3	40.2	40.1	40.0	88	1.9	1.8	1.6	1.5	1.4	1.3	1.2	1.0
44	40.0	39.9	39.8	39.7	39.6	39.6	39.5	39.4	89	0.9	0.8	0.7	0.5	0.4	0.3	0.2	0.1
45	39.3	39.2	39.1	39.0	39.0	38.9	38.8	38.7									

Add to the observed altitude of the Moon's upper limb, lower limb, or center; and apply also the additional correction from the daily page. The degrees of observed altitude are in the column, and the minutes across the top. If the minutes of observed altitude are between 0′.0 and 8′.0, use the first column of corrections; if between 8′.0 and 15′.0, use the second column; etc. If the minutes are exactly 0′.0, 8′.0, 15′.0, etc., use the right-hand column of the two possible.

For height of eye, and corrections for Sun, planets, and stars, see front cover.

STARS

Alphabetical Order					Order of SHA			
Name	No.	Mag.	SHA	Dec.	SHA	Dec.	No.	Name
			°	°	°	°		
Acamar	8	3.4	316	−41	14	+15	57	Markab
Achernar	5	0.6	336	−57	16	−30	56	Fomalhaut
Acrux	29	1.1	174	−63	29	−47	55	Al Na'ir
Adhara	19	1.6	256	−29	35	+10	54	Enif
Aldebaran	10	1.1	292	+16	50	+45	53	Deneb
Alioth	32	1.7	167	+56	55	−57	52	Peacock
Alkaid	35	1.9	154	+50	63	+ 9	51	Altair
Al Na'ir	55	2.2	29	−47	77	−26	50	Nunki
Alnilam	15	1.8	277	− 1	81	+39	49	Vega
Alphard	25	2.2	219	− 8	85	−34	48	Kaus Aust.
Alpha Tri. Aust. . .	43	1.9	109	−69	91	+51	47	Etamin
Alphecca	40	2.3	127	+27	97	+13	46	Rasalague
Alpheratz	1	2.2	359	+29	97	−37	45	Shaula
Al Suhail	23	2.2	223	−43	103	−16	44	Sabik
Altair	51	0.9	63	+ 9	109	−69	43	Alpha Tri. Aust.
Antares	42	1.2	113	−26	113	−26	42	Antares
Arcturus	37	0.2	147	+19	121	−22	41	Dschubba
Bellatrix	13	1.7	279	+ 6	127	+27	40	Alphecca
Beta Crucis.	31	1.5	169	−59	137	+74	39	Kochab
Betelgeux	16	0.1−1.2	272	+ 7	141	−61	38	Rigil Kent.
Canopus	17	−0.9	264	−53	147	+19	37	Arcturus
Capella	12	0.2	282	+46	149	−36	36	Theta Centauri
Caph	2	2.4	358	+59	154	+50	35	Alkaid
Deneb	53	1.3	50	+45	159	−11	34	Spica
Deneb Kaitos . . .	3	2.2	350	−18	160	+55	33	Mizar
Denebola	28	2.2	183	+15	167	+56	32	Alioth
Dschubba	41	2.5	121	−22	169	−59	31	Beta Crucis
Dubhe	27	2.0	195	+62	173	−57	30	Gamma Crucis
El Nath	14	1.8	279	+29	174	−63	29	Acrux
Enif	54	2.5	35	+10	183	+15	28	Denebola
Epsilon Argus . . .	22	1.7	235	−59	195	+62	27	Dubhe
Etamin	47	2.4	91	+51	209	+12	26	Regulus
Fomalhaut	56	1.3	16	−30	219	− 8	25	Alphard
Gamma Crucis . . .	30	1.6	173	−57	222	−70	24	Miaplacidus
Hamal	7	2.2	329	+23	223	−43	23	Al Suhail
Kaus Australis . . .	48	2.0	85	−34	235	−59	22	Epsilon Argus
Kochab	39	2.2	137	+74	244	+28	21	Pollux
Marfak	9	1.9	310	+50	246	+ 5	20	Procyon
Markab	57	2.6	14	+15	256	−29	19	Adhara
Miaplacidus	24	1.8	222	−70	259	−17	18	Sirius
Mizar	33	2.4	160	+55	264	−53	17	Canopus
Nunki	50	2.1	77	−26	272	+ 7	16	Betelgeux
Peacock	52	2.1	55	−57	277	− 1	15	Alnilam
Polaris	6	2.1	333	+89	279	+29	14	El Nath
Pollux	21	1.2	244	+28	279	+ 6	13	Bellatrix
Procyon	20	0.5	246	+ 5	282	+46	12	Capella
Rasalague	46	2.1	97	+13	282	− 8	11	Rigel
Regulus	26	1.3	209	+12	292	+16	10	Aldebaran
Rigel	11	0.3	282	− 8	310	+50	9	Marfak
Rigil Kentaurus . .	38	0.3	141	−61	316	−40	8	Acamar
Ruchbah	4	2.8	339	+60	329	+23	7	Hamal
Sabik	44	2.6	103	−16	333	+89	6	Polaris
Shaula	45	1.7	97	−37	336	−57	5	Achernar
Sirius	18	−1.6	259	−17	339	+60	4	Ruchbah
Spica	34	1.2	159	−11	350	−18	3	Deneb Kait.
Theta Centauri . . .	36	2.3	149	−36	358	+59	2	Caph
Vega	49	0.1	81	+39	359	+29	1	Alpheratz